Tanzania Seed Industry Survey

Report of Evaluations and Recommendations

Prepared by
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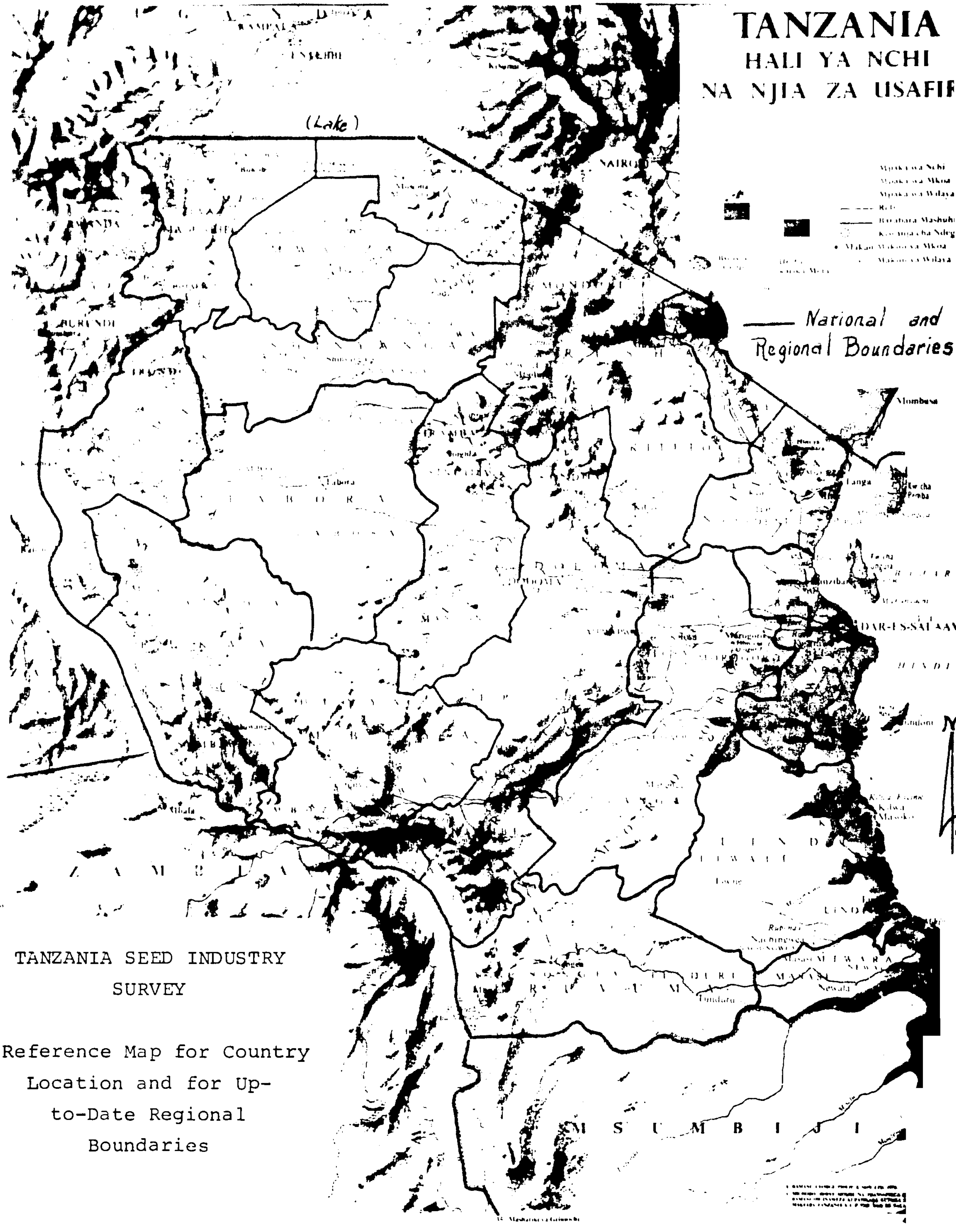

TANZANIA SEED INDUSTRY SURVEY

Reference Map for Country Location and for Up-to-Date Regional Boundaries

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PREFACE

This report of a survey of the seed industry in Tanzania resulted from a contractural arrangement between the University of Missouri, Columbia (UMC) and USAID/Washington and the USAID Mission in Tanzania. The work was performed under Contract AID/Afr-C-1139, Work Order No. 7. A copy of the work order assignments is included in Appendix Section F.

The seed industry survey was conducted in two separate stages. A preliminary survey was completed during November and December, 1978, by a team of three consultants from the University of Missouri. Team members included C. Brice Ratchford, Agricultural Economist and team leader; William J. Murphy, Extension Agronomist; and Lloyd Cavanah, Agronomist and Seed Specialist. The general survey was summarized in a report which included detailed procedural suggestions for the second stage of the survey.[1/]

The second phase involved work in Tanzania during March and April of 1979 by a University of Missouri team of consultants as follows: Albert R. Hagan, Agricultural Economist/Extension and team leader; Robert J. Bevins, Agricul-

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[1/] C. Brice Ratchford, Lloyd E. Cavanah, and William J. Murphy, Tanzania Seed Industry Survey, Interim Report, January, 1979.

tural Economist/Marketing; Lloyd C. Cavanah, Agronomist/Seed Specialist; and John M. Poehlman, Plant Breeder/Institutional Specialist.

Biographical data for each team member are included in Appendix Section E.

Working procedures in Tanzania included personal conferences with officials involved in various segments of the seed industry, with regional and district officials, with staff members of research and training institutions, with managers of Foundation Seed Farms and TanSeed operations, with officials of selected ARIs and MATIs, and with staff members of the USAID Mission and TanGov. Such contacts are documented chronologically and specifically in Appendix Section D.

Organization of the report has been prepared as a working guide for USAID and TanGov officials in further designing and implementing programs and projects to improve the seed industry in Tanzania.

Highlights of the seed industry problems and recommendations for alleviating them are reviewed in a concise summary at the beginning. Further details relative to each component of the seed industry are summarized in the ensuing chapters, including specific recommendations and the reasons for them.

Acknowledgments

Members of the survey team are grateful for the many courtesies and types of assistance provided by staff members

of the USAID Mission, the Ministry of Agriculture, and related institutions and agencies. Peter Shirk served as Mission contact person for the team and was considerate and helpful in every way. He and Charles Bernhardt were indispensable in arranging logistics and handling operational problems.

Members of the Mission staff--including Howard Steverson, Director, Jerry French, Barry Hill, Mr. Fuchs-Carsck, Peter Shirk, and others--provided valuable counsel in organizing the in-country work and, especially, in preparing a more useful report.

Ministry of Agriculture staff members--especially Mr. Khamisi, Mr. Mtenga, and Mr. Mashelle--were very helpful in providing factual information and advice on workable adjustments. Several conferences with Mr. Beardall and Foundation Seed Farm managers and supervisors--including Gibb Boyd, Lewis Jones, Charles Mmari, Ted Lane, and others--provided valuable information on resources, limitations, and problems of operation and management of the individual seed farms. Similar insights into TanSeed operations were provided by several staff members--especially by Mr. Budd, Mr. Mackey, and Mr. Ngonyani.

Others whose advice and assistance were especially helpful included Ron Gollehon, ACDI advisor with TRDB; Bob Maxwell, Manpower Training advisor; Dr. Duffield, Dr. Spurling, and Dr. Deutsch with the Maize and Sorghum Breeding Projects; Roger Simmons, consultant for the Manpower Survey; Will

Rogers and staff of the British-sponsored TanWatt research and maize breeding/production programs at Njombe; staff members of ARIs and MATIs at Uyole, Mlingano, and Tengeru; officials of donor institutions--including the British at Njombe, the Nordic group at Mbeya, the Germans at Tanga, and Canadians at Lyamungu; the RDDs, RADOs, and other officials in the regional offices visited; and, finally, staff members of the National Seed Lab and the College of Agriculture at Morogoro.

Appreciation also is extended to USAID/Washington staff members who arranged the assignment and advised on its conduct--especially Julie Defler, Boyd Whittle, and Robert Jackson.

Special commendations are extended to Ms. Khuri who typed the first draft of the report in Dar es Salaam and to Ms. Rosanne Smith who typed all of the final draft for reproduction.

LIST OF ACRONYMS

A long list of agencies, institutions, and government positions related to the seed industry in Tanzania. For simplicity and brevity in writing, some of these will be referenced with the following acronyms:

INTERNATIONAL ORGANIZATIONS

ACDI - Agricultural Cooperative Development International

AVRDC - Asian Vegetable Research Development Center (Shankne, Taiwan)

CIAT - International Center of Tropical Agriculture (Hyderbad, India)

CIDA - Canadian International Development Agency

CIMMYT - International Center for Maize and Wheat Research (Mexico)

FAO - Food and Agriculture Organization of the United Nations

ICRSAT - International Center for Research Semi-Aid Tropics (Cali, Colombia)

IDA - International Development Association

IFAD - International Fund for Agricultural Development

IITA - International Institute of Tropical Agriculture (Ibadan, Nigeria)

IRDB - International Bank for Reconstruction and Development (World Bank)

IRRI - International Rice Research Institute (Los Banus, Phillipines)

SIDA - Swedish International Development Association

USAID - United States Agency for International Development

TANZANIA ORGANIZATIONS AND POSITIONS

AFO - Assistant Field Officer

ARI - Agricultural Research Institute

CCM - Chama Cha Mapinduzi (the sole political party of Tanzania)

DADO - District Agricultural Development Director

DDC - District Development Council

DDD - District Development Director

DLDO - District Livestock Development Officer

FSE - Farming System Economist

KILIMO - Ministry of Agriculture

LIDA - Livestock Industry Development Authority

MATI - Ministry of Agriculture Training Institute

NAFCO - National Agricultural and Food Corporation

NIT - National Institute of Transport

NMC - National Milling Corporation

NTC - National Transport Corporation

PMO - Prime Minister's Office

RADO - Regional Agricultural Development Officer

RD - Recommendation Domains

RDC - Regional Development Committee

RDD - Regional Development Director

RLDO - Regional Livestock Development Officer

RO - Research Officer

RPLO - Regional Planning Officer

TANGOV - Government of Tanzania

TANSEED - Tanzania Seed Certification Agency

TANWATT - Tanganyika Wattle Company Limited

TAT - Tobacco Authority of Tanzania

TCA - Tanzania Cotton Authority

TCB - Tanganyika Coffee Board

TFA - Tanganyika Farmers Association

TOSCA - Tanzania Official Seed Certification Agency

TRDB - Tanzania Rural Development Bank

Summary and Recommendations

This report covers a survey of the Tanzanian seed industry by a consulting team from the University of Missouri, Columbia. The nature of the study and the team members responsible for this second phase are indicated in the preface to the report.

The purpose of this summary is of a threefold nature: to provide a brief overview of the seed industry in Tanzania; to explain the structure of the report; and to highlight the survey team's recommendations for future improvements.

The overall seed industry in Tanzania is similar to that of most developing countries. Much of the seed planted in each growing season comes from the peasant farmers' production from the previous year. This so-called traditional seed often is of poor quality because of primitive storage conditions and has limited potential for increased yields with improved technology. Even so, it has become adapted to local climatic conditions and traditional cultural methods and farmers are reluctant to change to new varieties.

Another kind of seed widely used is sometimes called "commercial seed." The original source of this seed often is unknown and seed quality, from the standpoint of purity and germination, is questionable as well. This segment of the industry may include private entrepreneurs as well as various institutions and agencies.

The focal point of this study is centered on the improved seed industry, a segment designed to achieve substan-

tial increases in yields and total production of major food grain crops in the years ahead. This segment has emerged during the past decade or longer as the result of concentrated efforts by the Tanzanian Ministry of Agriculture with assistance from USAID and other donors.

Structurally, the improved seed industry may be separated into five major components--the development of breeder seed through research; the Foundation Seed Farms for expanding pure lines of improved varieties; certified seed production, processing and primary distribution through TanSeed; purity and quality control by the Seed Laboratories and TOSCA; and final distribution to farmers through the efforts of regional and district governments, TRDB, and other institutions. These different components are explained and illustrated in greater detail in Chapter I.

The primary concern of TanGov and the USAID Mission was the future development of the Foundation Seed Farms, of TanSeed operations, and of the Seed Laboratories and TOSCA. Early chapters of this report--II, III, and IV--are devoted specifically to each of these three components of the industry in order. Each chapter includes a brief description of the current situation, identification of the major constraints which hinder development, and specific recommendations for overcoming the problems. Chapter V and Annex V in Appendix Section B were added to suggest specific corrections and adjustments in the National Seeds Act.

Recognition also was given to supporting organizations and programs which are essential for successful growth and

performance of the improved seed industry over time. Special attention in this study was given to improvements in research, extension, and marketing programs and activities. Condensed suggestions for each are included in Chapters VI, VII, and VIII, in order, while more detailed information is included in associated annexes in Appendix Section B of the report.

Recommendation Highlights

Specific recommendations for each component of the seed industry and the supporting institutions are given in the chapters as outlined above--as well as the reasons for them. Since pages in the table of contents permit ready reference to each, they will not be repeated in any detail in this summary.

Probably the recommendation of most immediate concern to TanGov and USAID relates to future development of Foundation Seed Farms. The survey team has recommended that only three such farms--the Arusha, Dabaga, and Msimba units--be developed for this component of the improved seed industry. Other uses were suggested for farms under other initial stages of selection or development. Reasons for this recommendation are specified in Chapter II.

From the standpoint of priority for USAID support and financing, the survey team suggests that first attention be given to rapid development of the three Foundation Seed Farms. Specific suggestions are itemized in Chapter II. Since the Dabaga farm is new, early priority should be given to pro-

viding adequate staff, staff housing, and detailed planning for farm and farmstead layout in preparation for the construction of service buildings and erosion control improvements.

A second priority of considerable urgency is to implement the recommendations for getting the National Seed Laboratory and the two branches in full operation as soon as possible. This involves considerable investment in facilities but, most of all, some highly qualified expatriate assistance at an early date to help avoid mistakes in further development. Types of assistance needed are specified in Chapters IV and X.

Third priority in providing assistance should be directed to future development of TanSeed operations to handle all phases of seed certification. Specific needs for consideration are itemized in Chapter III.

Associated with each of the above three categories are the continuing needs for manpower training and technical/professional assistance in the fields of research, extension, and marketing. Some suggestions for these types of assistance are outlined in Chapters VI, VII, VIII, and X.

Members of the survey team have appreciated the challenges of this assignment and wish to express appreciation to the many individuals who have provided advice and assistance.

I. INTRODUCTION

1.01 This introductory chapter was designed for three purposes--to stress the importance of improved seed in agricultural development, to describe the seed industry in Tanzania, and to explain the organization of this report.

1.02 High quality seeds of improved and adapted crop varieties are essential for any substantial improvement in productivity of the agricultural sector of the economy. Good seed alone, however, may have little impact and must be combined with other improved technologies--fertilizers, pesticides, herbicides, better cultural practices, etc.--for maximum benefits. Nevertheless, an abundant supply of top quality seed is the foundation on which to build higher cropland productivity. Recognition of this need is demonstrated by numerous seed improvement projects of KILIMO and donor institutions for more than a decade.

1.03 A brief description of major segments of the Tanzanian seed industry may help clarify misunderstandings and explain recommendations resulting from the seed industry survey.

Divisions of the Tanzanian Seed Industry

1.04 The seed industry in Tanzania may be classified, somewhat arbitrarily, into three major divisions--the traditional, the commercial, and the improved (certified) seed

component. The first two will be considered briefly; the third in greater detail.

Traditional Seed

1.05 Probably a high percentage of the seed planted for Tanzania field crops each year never enters commercial channels. Traditionally, the peasant farmer saves a portion of his current production for next year's sowing. The quality of the seed often deteriorates because of inadequate storage facilities and the heritage is largely unknown. However, the so-called local seed has evolved through "survival of the fittest" and may be well adapted to prevailing conditions. This may explain why local varieties sometimes outperform improved varieties, especially when no other improved technologies are applied.

1.06 Future planning of the seed industry should be based upon the premise that reliance upon local seed supplies by peasant farmers will persist for many years to come. They have greater confidence in the local varieties which have performed well, by their standards, over a period of many years (often under adverse conditions) than in new, improved, varieties which are unproven locally. They seem to be more security-minded than profit-oriented. Thus, well-conducted field trials and result demonstrations in local areas are essential for motivating any general shifting to improved varieties.

Commercial Seed

1.07 Another source of seed for the Tanzanian market originates with individual entrepreneurs, companies, and government agencies which assemble seed from many sources for distribution and sale in local areas. Such seeds often are of unknown origin, variety, germination, and general quality. Much of the imported seed, according to some reports, is very low in germination--probably because of the time required for overseas shipment and the storage conditions while in transit.

1.08 As the output of certified seed increases through expansion of TanSeed operations, some might move through commercial channels of distribution.

Improved (Certified) Seed

1.09 In the opinion of the survey team, the first and most urgent need in evaluating the improved seed industry and in recommending future developments and adjustments is to clarify--or at least gain a common understanding of--terms and concepts associated with the overall program. Much confusion seems to prevail. An example is the term "seed farm." This could apply to a farm on which the plant breeder lays out his plots for growing and evaluating the new varieties he is developing and testing. It could refer to a Foundation Seed Farm with the unique function of expanding and maintaining a number of pure lines of different varieties in sufficient quantity to produce the certified seed needed. Or, the term could apply to special farms where certified seed is

produced. Hence, when a suggestion is made to establish additional seed farms, the first question to ask is "what kind?"

1.10 In order to achieve some consensus on terminology, the improved seed industry may be separated into distinct components, each of which serves a specific and unique function. Five major components seem to characterize the industry, in addition to the distribution within each region which might be considered a sixth component.

1.11 The five components include Plant Breeders (research component), Foundation Seed Farms, Seed Laboratories, TOSCA, and TanSeed. Each can be considered from both a structural and a functional point of view. As a paradox, they must be closely correlated and integrated from a structural viewpoint but, to avoid confusion and complications, functional performance should be separate and distinct.

1.12 Four models, in chart form, have been prepared and, hopefully, will help eliminate some of the confusion and misunderstanding. Each will be explained briefly.

1.13 Figure 1.1--Structure and Functions of Major Components of the Improved Seed Industry in Tanzania. The primary purpose of this chart is to illustrate structure and structural relationships and to show locations of principal activities. Notations about the functions of each component are obviously incomplete and somewhat incidental.

1.14 Plant Breeders (Component No. 1) may either develop new lines and varieties of field crops or adapt to local conditions those acquired from other sources. They

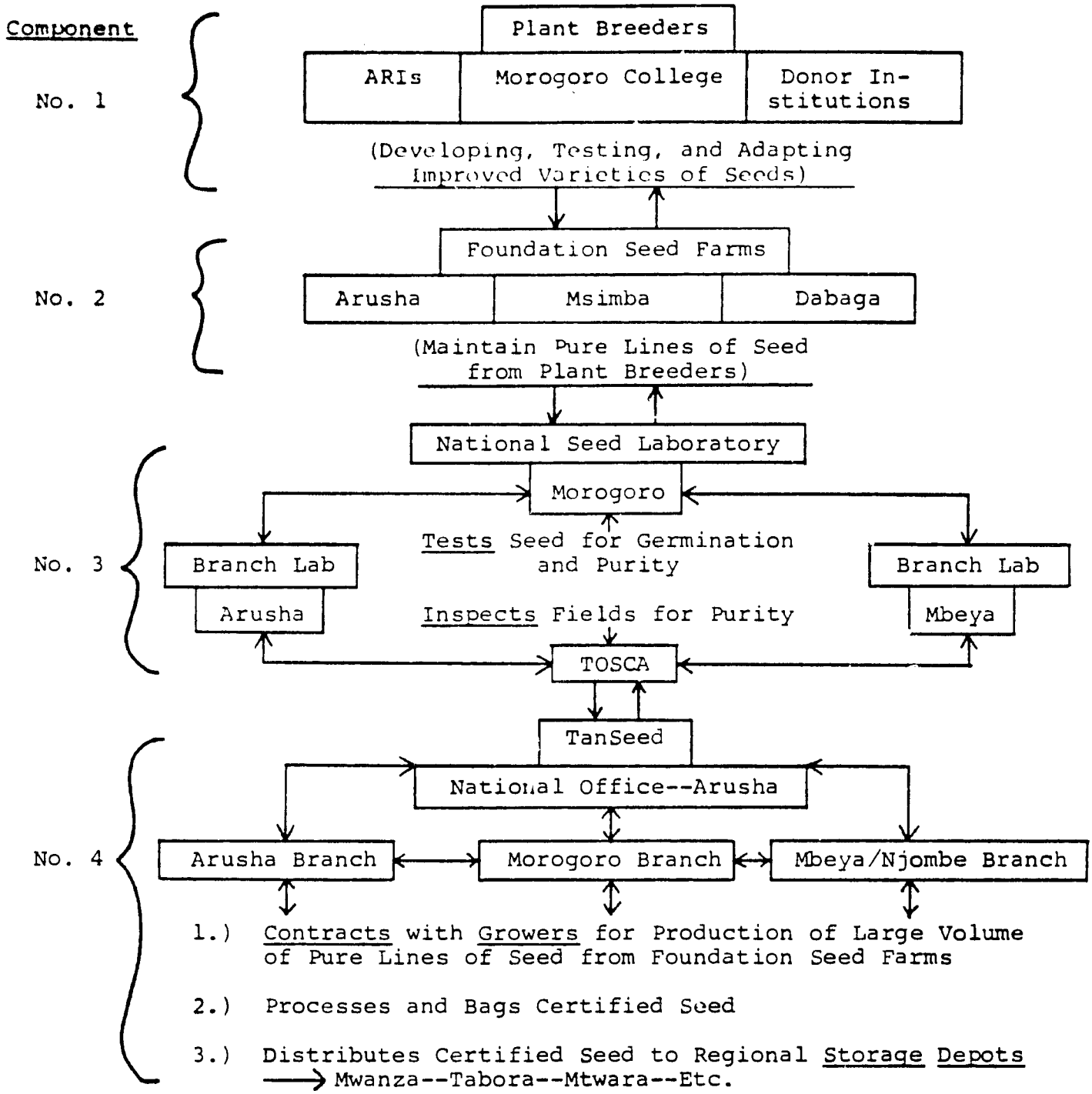

Figure 1.1 Structure and Functions of Major Components of the Improved Seed Industry in Tanzania

must have facilities for growing (in small quantities) the seed under development and for storing and maintaining the germ plasm for the new varieties. They transmit seed for most promising and approved varieties to the Foundation Seed Farms for increase under carefully controlled conditions. Plant breeders (researchers) are associated with Morogoro College and Crop ARIs, the location of which are shown in Figure 6.1. Detailed discussions of research constraints and recommendations are included in Chapter VI and in Appendix Section B, Annex VI.

1.15 Foundation Seed Farms (Component No. 2) expand and maintain the purity and quality of improved varieties of seed provided by plant breeders. They harvest, clean, process, and deliver pure lines of selected varieties to TanSeed, from which certified seeds are produced. (Locations of the Seed Farms are shown in Figure 2.1.) Recommendations relative to the Seed Farms are outlined in detail in Chapter II.

1.16 TanSeed (Component No. 4) is responsible for getting pure seed of selected crop varieties from the Foundation Seed Farms and for arranging with contract growers to produce certified seed. Fields of contract growers are supervised and inspected prior to harvest. Then the harvested seed is processed, bagged, and delivered to their distribution depots at selected locations, as shown in Figure 3.1. Chapter III contains specific recommendations for future development of TanSeed operations.

1.17 Seed Laboratories and TOSCA (Component No. 3) have closely related responsibilities and are grouped together on

this chart. The National Laboratory at Morogoro and the branches at Arusha and Mbeya (tentative location) are located as shown in Figure 4.1. They test seed samples for germination and purity for both TanSeed and the Foundation Seed Farms and staff members assist TOSCA with field inspections during rush periods. TOSCA is the official regulatory agency for checking compliance with the National Seeds Act. Functions of the seed laboratories and TOSCA, and recommendations for their future development, are presented in Chapter IV.

1.18 Figure 1.2--Structural Components and Functions of the Improved Seed Industry in Tanzania. This chart combines both structural relationships and primary functions of the five major components of the improved seed industry. Careful study of the model should reveal the interrelationships of the five components and the unique and distinctive functions of each as well.

1.19 Figure 1.3--Year-by-Year Process for Maintaining Pure Varieties of Self-Pollinating Crops and for Providing Certified Seed to Farmers. This chart highlights the flow of improved seed from the plant breeder down to individual farmers who plant the certified seed. The separate functions of the Foundation Seed Farms and TanSeed are clearly shown.

1.20 Figure 1.4--Schematic Flow Chart for a Proposed Improved Seed Program for Tanzania. The purpose of this model is to show interrelationships among three major segments of the improved seed industry from the standpoint of responsibilities of each, the agencies involved, and the two-way flow

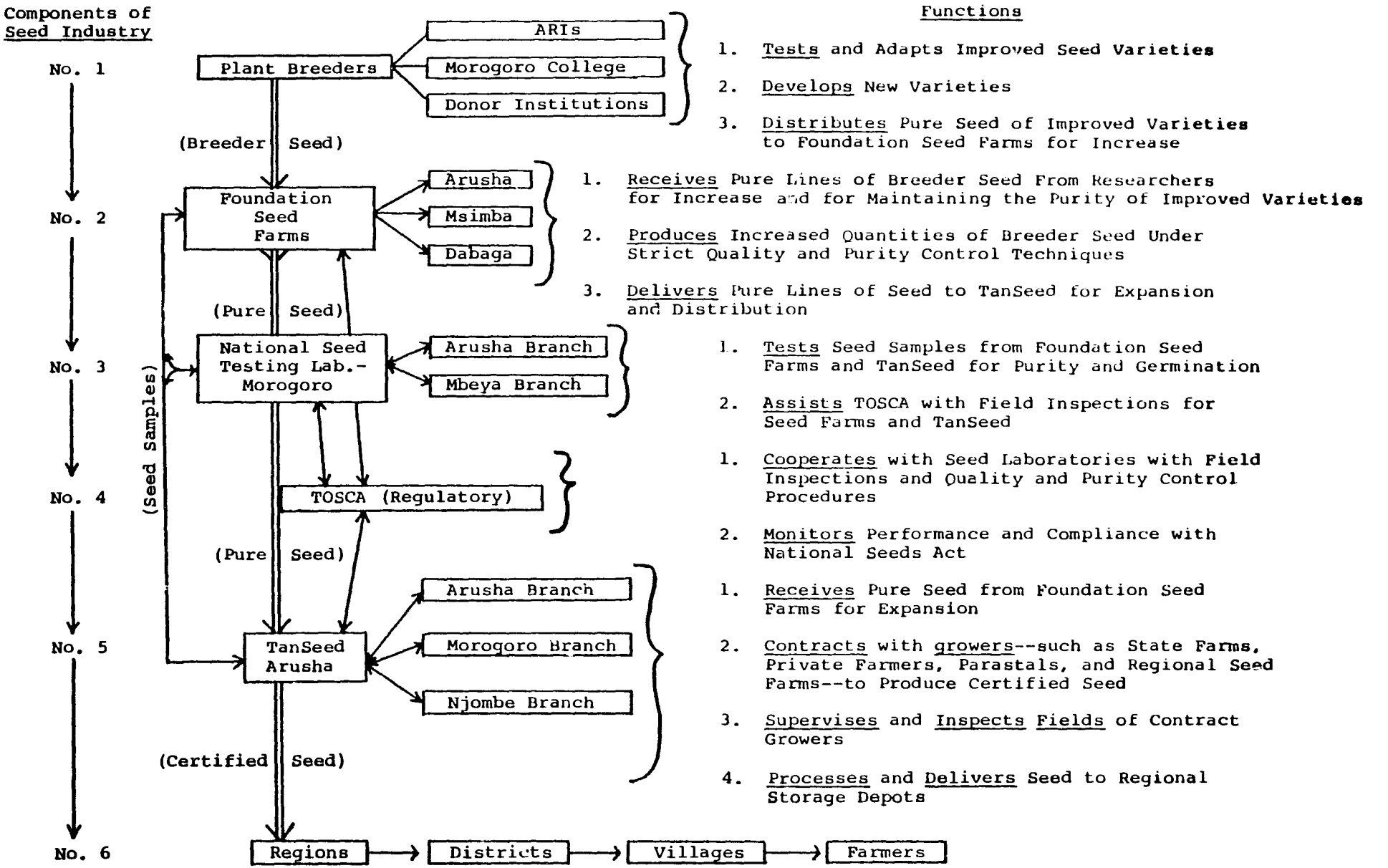

Figure 1.2 Structural Components and Functions of the Improved Seed Industry in Tanzania

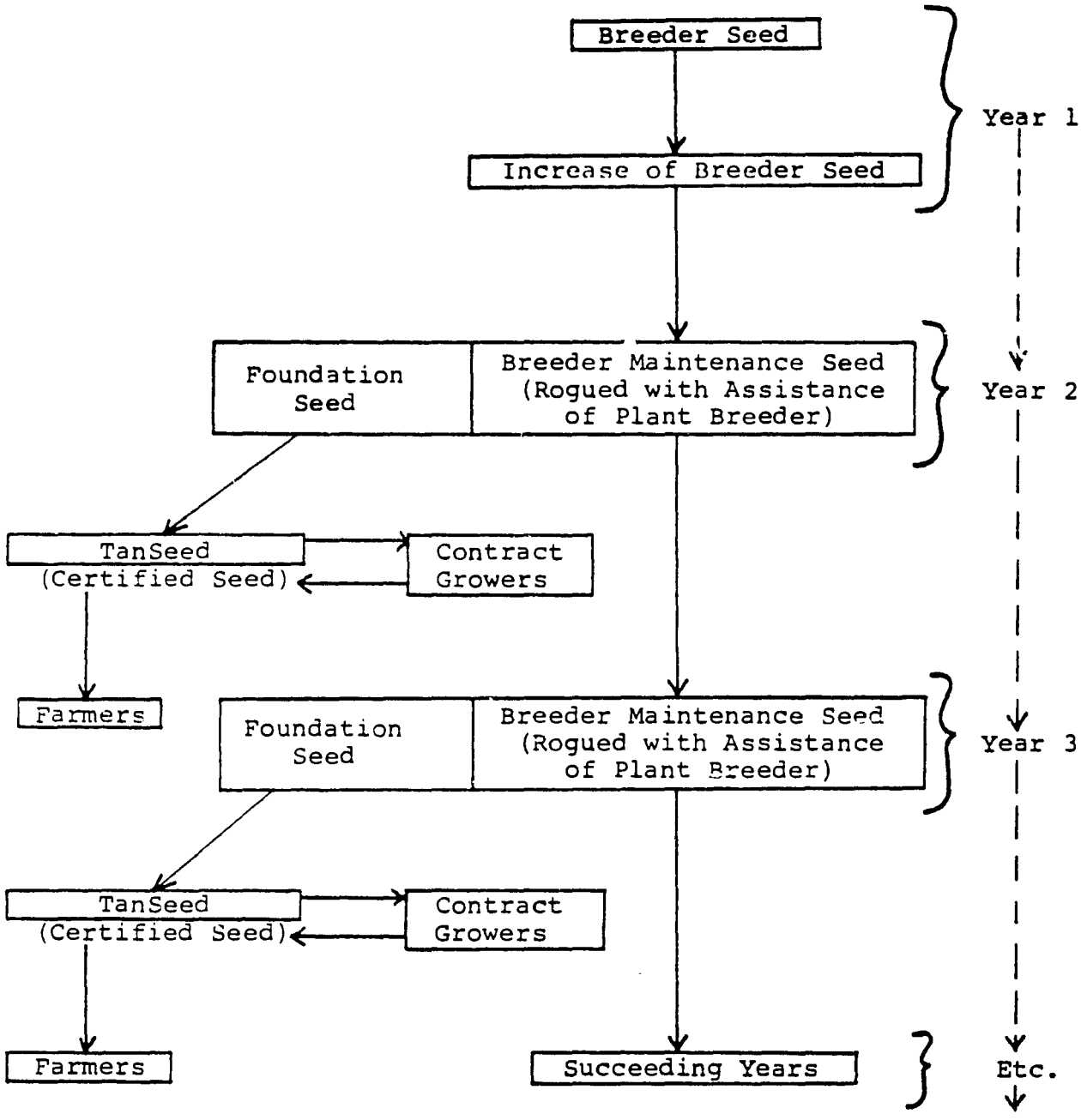

Figure 1.3 Year-by-Year Process for Maintaining Pure Varieties of Self-Pollinating Crops and for Providing Certified Seed to Farmers

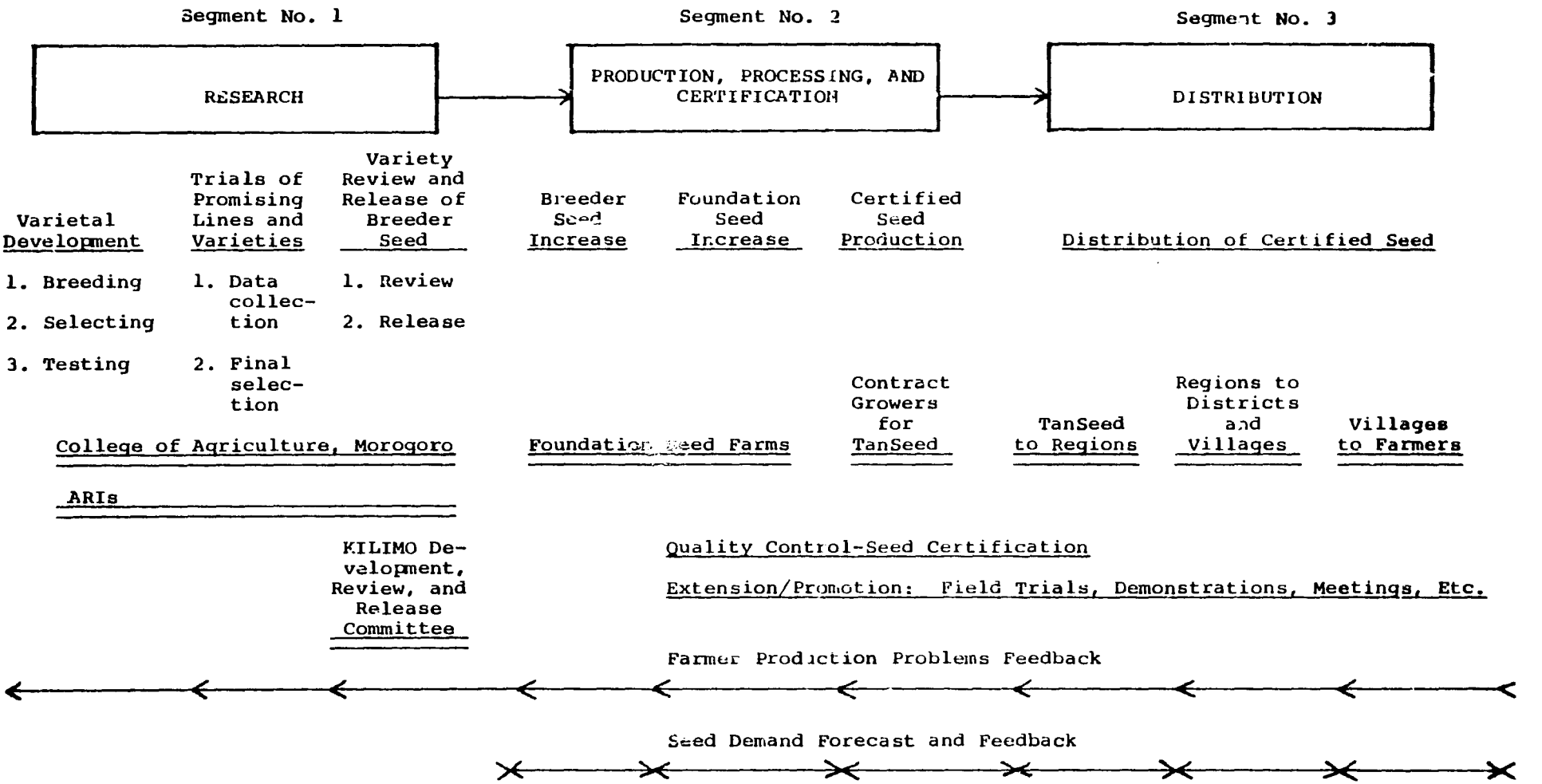

Figure 1.4 Schematic Flow Chart for a Proposed Improved Seed Program for Tanzania

of communications throughout the system. This three-way breakdown includes research (Segment No. 1) as the starting point for improved seed; seed production, inspection, and processing as Segment No. 2; and the seed delivery system as Segment No. 3.

1.21 Summary: This overall picture of the improved seed industry in Tanzania should help clarify functions and relationships among the different components and provides the rationale for organization of the report and the specific recommendations contained therein.

Organization of Report

1.22 The rationale for the arrangement of chapters and sections of the report is related to the nature of the seed industry; to the specific survey team assignments; and to priorities established by the USAID Mission and TanGov.

1.23 First of all, the report is separated into two major parts. Part A (including Chapters II, III, IV, and V) contains the three major components of the improved seed industry and the legislation regulating them--the Foundation Seed Farms, Certified Seed Production through TanSeed, the Seed Laboratories and TOSCA for quality control, and the Tanzania Seeds Act. These are the segments with which USAID has been most directly involved during the past decade. And, finally, staff members of both USAID and TanGov placed highest priority on these components for further investments in improvements.

1.24 Part B of the report (including Chapters VI through X with some associated annexes) relates to secondary team assignments and to supportive aspects of the seed industry--including research, extension, marketing, linkages and coordination within the system, and manpower training.

1.25 Four chapters (V, VI, VII, and VIII) included substantial amounts of detailed background information. For easier reading, each of these chapters was divided into two parts--the first a condensed summary chapter in the main section of the report and the second, an associated annex in Section B of the Appendix. The two are keyed together to avoid confusion. For example, more detailed information for Chapter V is included in Annex V, with the same combinations for the other divided chapters.

1.26 For ready reference, all paragraphs are numbered, with a separate series keyed to each chapter and to the associated annex. For example, paragraphs in Chapter V are numbered 5.01, 5.02, 5.03, etc. while those in the related Annex V are numbered 5.1.01, 5.1.02, etc.

1.27 Pages are numbered consecutively throughout the entire report, including the appendix sections.

1.28 Reference figures and tables also are numbered to coincide with the chapter in which they first occur. For example, the locational maps for Foundation Seed Farms is identified as Figure 2.1, since it is the first figure in Chapter II.

1.29 The primary purpose for some of the above arrangements was to expedite writing, assembling, typing, and print-

ing the final report within the limited time period specified in the USAID contract.

II. THE FOUNDATION SEED FARMS SITUATION

2.01 As noted in Figures 1.1, 1.2, and 1.3, the Foundation Seed Farms play a unique and crucial role in the Tanzania Improved Seed program. Their establishment was a primary recommendation in the time-phased seed multiplication study completed a decade ago.[1/]

2.02 The special study indicated that these seed farms were to be specialized farms utilizing high levels of mechanization and management to produce "foundation grade" seed. (Foundation grade seed is produced from breeders seed. The production of foundation seed is a highly sophisticated operation that requires well-trained personnel in all phases of the seed production and processing. Maintenance of the varieties--assuring their genetic purity and identity--require this special care.)

2.03 Ecological zones were used as the basic criteria in farm site selection. Elevation and rainfall were the key variables. The farms were developed before assessing the availability of the major resources and inputs necessary for a continued stable supply of breeder and foundation seed. Soil surveys are just being completed in 1979. These surveys reveal many deficiencies and suggest management systems that may or may not be followed at present.

[1/] Anonymous--A Time-Phased Seed Multiplication, Distribution, and Implementation Plan for the Republic of Tanzania--E. A. Project No. 185, November 1969.

2.04 Four such farms have been started and are in various stages of development. The first, Msimba, was started in 1971. The Arusha unit was initiated a year or two later, while the Kibaha and Dabaga farms are just getting started in 1978-79.

2.05 USAID has provided the major support for establishing and developing the Foundation Seed Farms, in close cooperation with the Ministry of Agriculture of TanGov. Experience, Incorporated, has been the primary USAID contractor. Developing the farms to the point where they can perform efficiently in the role they were designed to serve has been a difficult and demanding task. Heavy investments of capital and skilled manpower have been required and will be needed for future developments as well as for year-to-year operations. After seven or eight years of development, only the first two farms are approaching the stage of effective operation.

2.06 Because of conditions such as the above, the USAID Mission and TanGov are at a crossroads in making major decisions about development and operation of the farm units. To assist in making such decisions, the seed survey team was selected to make an overall evaluation of the improved seed industry; to assess the special functions served by the Foundation Seed Farms; to identify problems which hinder their development and successful operation; and to make specific recommendations for the future course of developments.

2.07 In conducting the assignment, the survey team posed several questions to guide the evaluations and recommendations relative to the Foundation Seed Farms:

1. What are the primary components of the improved seed industry and what role is each designed to serve?
2. Are Foundation Seed Farms essential to the seed industry?
3. If so, how many are needed?
4. What are the primary requirements for a successful Foundation Seed Farm?
5. What constraints hinder achievement of the conditions essential for success?
6. What courses of action are recommended for the seed farms in total and for each farm in particular?
7. What are the basic reasons for each recommendation?
8. What alternatives are available for unused resources?

These questions, patterned after the "Framework for Analysis" in Appendix Section A, generated the logic by which the evaluations were made.

2.08 How to present information on the above questions and recommendations concerning them was a troublesome task for the survey team. Finally, a decision was made to proceed in the following three-step manner: (1) outline the team's "answers" to the first five questions in a concise and somewhat categorical manner; (2) itemize the overall recommendations and reasons underlying each; and (3) summarize separately the situation and recommendations which apply only to the individual farms. The remainder of this chapter will be presented in this order.

Questions for Evaluation

Components of the Improved Seed Industry

2.09 In response to Questions 1 and 2, the major components of the seed industry are described in Chapter I and structural and functional relationships are illustrated in Figures 1.1 through 1.4. A careful study of these reveals the indispensable function served by the Foundation Seed Farm Years of research to develop and test a single new variety ma be wasted effort unless it is kept pure and of high quality until delivery to certified seed producers through TanSeed.

Number of Foundation Seed Farms Needed

2.10 After careful study, the survey team has concluded that three well-developed and well-managed Foundation Seed Farms can serve all the needs of the seed industry in the foreseeable future--for the following reasons:

1. Large acreages of each new variety are not needed to supply the quantities of seed needed for certified seed production;

2. More than enough good land is available on three of the present seed farms--those at Arusha, Msimba, and Dabaga--to supply TanSeed with all the foundation seed needed for certified seed producers, for several years to come;

3. The heavy capital investments required for specialized field machinery, buildings, and processing equipment, if not needed, can be used to much better advantage in other components of the seed industry, as suggested later; and

4. Since highly sophisticated management and competent skilled labor are essential for each seed farm, it seems wise to concentrate the available supply to

develop three good farms--quickly and completely--rather than struggle for several years to part-way develop four or more which never function properly.

2.11 In view of the above, the survey team recommends that renewed efforts be made to accelerate development of the Arusha, Msimba, and Dabaga farms and that the Kibaha farm unit be converted to other more appropriate uses, as later suggested. Locations of recommended farms are shown in Fig. 2.1.

Requirements for a Successful Foundation Seed Farm

2.12 A Foundation Seed Farm is a highly specialized farming unit with managerial and labor requirements and other resources far in excess of those needed for a top commercial farm of comparable size. Ideally, each farm should have the following:

1. Good, productive soil--preferably consisting largely of class I and class II land;

2. Soil, relatively high in natural fertility, especially in calcium and the pH level, because of the high cost of lime applications (approaching $100 per ton in some localities);

3. Adequate rainfall during most growing seasons;

4. Available irrigation water and distribution equipment for at least a portion of the farm acreage to help guarantee regular propagation of important seed lines;

5. A long-range management plan for erosion control, field layout, a systematic cropping system, access to field roads, etc.;

6. All-weather access roads, to help assure timely delivery of supplies, machinery and equipment repairs, etc., and to facilitate frequent and dependable communication with researchers, TanSeed officers, field inspectors, and other officials;

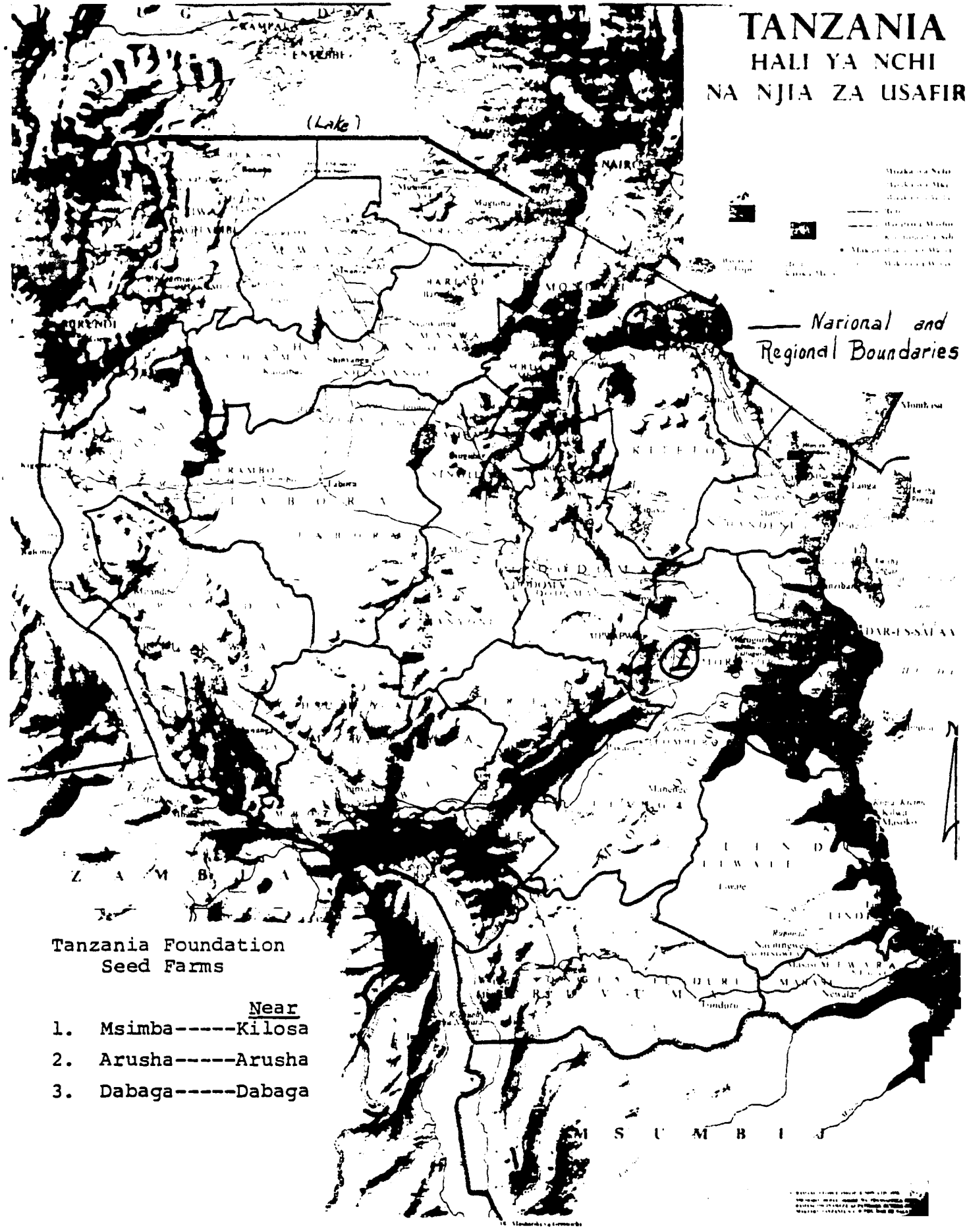

Figure 2.1 Location of Foundation Seed Farms

7. Adequate buildings for offices, for machinery, (including storage, repair shop, parts room, etc.), for seed processing and storage (including a small cold storage unit at each location), and for staff housing;

8. Up-to-date specialized field machinery and seed processing equipment;

9. A highly trained and reliable farm manager, along with a back-up assistant;

10. A well-trained mechanic/engineer and an assistant to keep field machinery and processing equipment working properly at all times;

11. Highly skilled labor to carry out the complex field and processing operations, with sufficient incentives to assure long-term employment;

12. An expatriate counterpart for 1 to 2 years at each farm to counsel and advise with the Tanzanian management, until the farms are fully developed and in full operation;

13. An expatriate counterpart in mechanics (such as Ted Lane at Arusha) for 1 to 2 years to provide further training for Tanzanian mechanics;

14. TDY assistance, as specified in Chapter X, for specialized assistance and training; and

15. A system of accounts and records to monitor and evaluate each year's progress and performance.

General Constraints

2.13 Many constraints which hinder development and proper operation are common to all the seed farms. Such constraints, of a general nature, are itemized below without elaboration. More specific ones will be presented for each seed farm separately.

1. Spreading resources--capital, equipment, and trained personnel--too thinly in attempting to develop four or more Foundation Seed Farms;

2. Difficulties and delays in acquiring equipment and repairs (spare parts) for field machinery and processing equipment;

3. Undue management complexity in attempting to produce and process both foundation seed and certified seed with the same field machinery, processing equipment, and work crews;

4. Lack of a complete water management and field layout plan for each farm to control soil erosion and to implement a systematic and efficient production program; and

5. Inability to hold highly trained and competent managers, mechanics, and skilled workers in competition with other types of employment where pay scales are higher and responsibilities less demanding.

2.14 Recommendations relative to these constraints and justifications for them are outlined below and are keyed to the above constraints.

General Recommendation No. 1

2.15 Limit the number of Foundation Seed Farms to the three at Arusha, Msimba, and Dabaga and do everything possible to accelerate their development. Reasons for these limitations and suggestions are specified in paragraph 2.10. Suggestions for further development will be presented in the separate section for each farm.

2.16 This recommendation involves termination of efforts to develop the Kibaha unit as a Foundation Seed Farm. This recommendation is based upon the following facts:

1. The soil types are low in fertility and productive potential. No class I and II soils are available. According to a recent soil survey,[2] "approximately

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[2] John Swenson (Soil Survey Team Leader), Soils Survey, Kibaha Foundation Seed Farm, Experienced, Incorporated, Contract AID/Afr-[illegible]175, February 1979, page 1.

67 percent of the farm is class III land; 16 percent is class IV; and 17 percent is class VI."

2. Both fertilizer and lime requirements are high for satisfactory crop production. (Note Appendix Table I for supporting information included in a report by Gibb Boyd, Kibaha farm manager.)

   For example, the only class III soil on the farm (and the best class available) is called Kibaha sandy loam (Series KiB). It constitutes about 67 percent of the farm. It is described in the soil survey as follows:

   The soil is low in fertility. The cation exchange capacity and base saturation are both low. Base saturation is less than 35 percent. pH is generally less than 5.0. Heavy applications of lime and fertilizer will be required on a continuing basis in order to maintain good yields.[3/]

   An initial application of five tons of lime per acre, or more, would be required, with repeat applications every three to five years. Investigations by Mr. Boyd revealed a delivered cost of lime to the farm of approximately $100 per ton. Thus, the annualized lime cost alone would approximate $100 per acre.

3. Rainfall has averaged about 1,000 mm. per year during the past 12 years, but monthly distribution results in a long (7-month) dry period.[4/] From June through December, the rainfall averaged only 13.5 inches--slightly above 34 percent of the yearly total. According to the report, "the effectiveness of rain during this seven-month period is largely lost because it comes in small amounts and is lost through evaporation or runoff."

4. Reports indicate little potential for irrigation water, at least not on an economic basis.

5. In view of the above conditions, it seems very doubtful if the farm could provide the stability of yields needed for maintaining the pure lines of seed required from a Foundation Seed Farm.

6. From an economic viewpoint, the farm probably would always be a low return/high cost operation. It seems doubtful if the low and erratic yields would generate enough annual income to cover the cost of

[3/] Ibid. Soil Survey, page 11.

[4/] Ibid. Soil Survey, page 2.

> soil treatments alone. In such case, nothing would be available to cover the other variable costs--machine costs, chemicals, labor, etc.--to say nothing about the high annual fixed costs resulting from the substantial investments needed on a seed farm.

2.17 In view of the above conditions, the survey team suggests that KILIMO consider some alternate use for the Kibaha unit in order to take advantage of the land clearing and other development work already completed. Three alternatives are suggested:

2.18 Alternative No. 1--Develop the farm into a Branch Research Station from an existing ARI--perhaps the Naliendele one at Mtwara. The sub-station research could be specialized in crops especially adapted to the sandy coastal area--such crops as cowpeas, green gram, sorghum, sesame, and groundnuts.

2.19 Alternative No. 2--Develop the farm for a commercial cashew plantation. Since the new processing plant is under development in Dar es Salaam and since cashew nuts are a major export commodity in Tanzania, this could become a profitable use of the land and provide a useful extension of the cashew nut research at Naliendele.

2.20 Alternative No. 3--Consider some other commercial crop well adapted to the sandy soil and rainfall conditions and for which good export demand is expected--perhaps some type of palm trees, sisal, or even groundnuts.

2.21 One other proposed Foundation Seed Farm--the Urambo farm in Tabora region--also was considered by the survey team. A review of the recently completed soil survey of the farm revealed conditions very similar to those at Kibaha--low fer-

tility, limited and erratic rainfall, little irrigation potential, etc. In view of the above discussion, it is recommended that KILIMO seek an alternative for this farm unit also.

General Recommendation No. 2

2.22 This recommendation relates to the "off-shore procurement procedures"--involving the ordering of machinery, equipment, and spare parts and going through the procedures of custom clearance and removal from port. During the past few years, GSO and other USAID Mission officials have taken time to assist with this. However, an exhorbitant amount of time has been required of the Project Coordinator--time he should have available to assist the Foundation Seed Farm managers with development and operational problems.

2.23 Excerpts from a study made by a team including Mr. Wightman and Mr. Johnson were reviewed by the Survey Team. The team recommends that a copy of the study recommendations be reviewed by USAID and TanGov and that the suggested procedures be implemented as soon as possible. Basically, the proposal recommends that TanGov assume responsibility for these functions and free the time of the project coordinator for other duties. Mr. Cornell Ishengoma was first assigned this responsibility but now is in school at Western Illinois University. Until his return, Mr. Mboya is learning to assume such responsibilities. This procedure should be expedited.

2.24 The survey team suggests this problem can be alleviated to some degree by developing greater standardization of lines of equipment, overtime, to minimize the number of companies involved and by encouraging Experience, Incorporated, and USAID to provide more timely logistical support.

General Recommendation No. 3

2.25 Briefly, the survey team recommends that the Foundation Seed Farms discontinue the practice of serving as contract growers of certified seed for TanSeed as soon as possible. Some of the reasons are itemized below.

1. It complicates management of the Seed Farms--already a complex operation because of the absolute necessity of keeping the lines of breeder seed pure and of high quality.

2. It may lead to mixups in seed varieties and seed qualities. (Some reports of such mixups were reported in Arusha region.) They would be hard to avoid in practice. For example, the Arusha farm was reported to be producing 6 to 8 different varieties of wheat breeder seeds. During harvest time, the combine must be thoroughly cleaned after harvesting each variety (probably with water under pressure and some dismantling of equipment). If certified seed must be harvested with the same equipment, further complications arise.

   Similar problems apply to seed processing, bagging, and storing.

3. Since the Seed Farms provide all the pure lines of seed varieties to TanSeed for use in their production of certified seed through contract growers, overlapping and confusion in the use of facilities often result.

2.26 Land on the Foundation Seed Farms not needed for the production of breeder seed at present may be converted to other uses. Some of the rougher land subject to severe erosion, especially on the Arusha and Dabaga farms, might be

shifted into production of legume and grass seed. Another alternative would be to use the land for some type of commercial production which would not interfere with regular growing of breeder seed. In such case, care must be taken to prevent cross-germination of some pure lines with commercial production of the same crop.

General Recommendation No. 4

2.27 Erosion is very severe on the Foundation Seed Farms, especially on those at Arusha and Dabaga. In order to minimize losses of soil, fertility, and moisture, the team recommends that TDY assistance be employed in the near future to develop complete water management and layout plans for each of the three farms. These plans should include detailed maps for each farm, showing waterways, terraces, structures, field layout, travelways, and any other features affecting farm organization and operation. A team of an Agricultural Engineer and a Farm Management Specialist should be secured for this detailed planning--preferably a team from Missouri where much of this joint planning has been done. A follow-up assignment or two could be used to train local contractors to do actual layout work and construction.

General Recommendation No. 5

2.28 The team recommends that the Foundation Seed Farms be set up as parastatal operations, either individually or as a group under the Agricultural Officer for the Seed Farms.

Another alternative would be to make them separate units of a parastatal in combination with TanSeed. Reasons for this recommendation are as follows:

1. Several years of intensive training and experience are required to develop competent managers and mechanics to organize the seed farms and to keep the complex operations operating on schedule. Highly skilled labor also is needed for the specialized field machinery and processing equipment. Such employees cannot be retained and adequately compensated under present arrangements.

2. Under present conditions, Seed Farms cannot compete with parastatals, commercial operations, and other kinds of employment where pay is higher and work less demanding.

3. Some kinds of salary adjustments and other incentives must be devised for keeping employees in the positions for which they were trained--often at substantial investments of time and capital. Unless such can be assured, the survey team questions whether the Foundation Seed Farms can ever be completely developed and well-enough operated to serve the purposes for which they were designed. A parastatal arrangement seems to be the only alternative for accomplishing these objectives under present conditions in Tanzania.

General Recommendation No. 6

2.29 The team recommends that some environmentally controlled storage be provided at each of the three seed farms--probably an amount equivalent to about 25 percent of annual production. This is to help assure that adequate supplies of improved varieties will be available for certified seed production each year, despite crop failures and other adversities.

2.30 Attention will now be turned to the three individual Foundation Seed Farms for a brief description of each and

the specific constraints and recommendations which apply to them individually.

The Msimba Seed Farm

Situation

2.31 The Msimba Foundation Seed Farm was acquired in 1971. It encompasses 6,200 acres from the Ilonga Sisal Estate. Forty-seven percent of the land is classed as I and II, 40 percent class III, and 13 percent class IV. An estimated 4,000 acres are suitable for cultivation. A set of houses and other buildings are already in place. Housing for staff and permanent workers are reported to be adequate. A full line of crop production equipment has been assembled. The farm is fully equipped to produce and process all grades of pedigreed seed. Most soils are reasonably adequate in plant nutrients, though plants do respond to nitrate and phosphates. Rainfall averages 30 to 40 inches and comes during the growing period. The elevation is 1,600 feet and the temperature ranges between 20°C to 30°C.

Specific Constraints

2.32 The Msimba farm is most fully developed of the three seed farms. Most troublesome constraints are those already discussed above. A few others need attention, with varying degrees of urgency, as follows:

1. Lack of usable access roads. The farm is located approximately 60 kilometers from the new highway, A-7, but is usually impassable during the rainy season. (For example, the survey team could not visit the farm during March and April because of road con-

ditions.) Reportedly, funds have been allocated for constructing a new road during past years but have always been diverted to other uses.

2. Substantial acreages of land on the farm are poorly drained and soil erosion is reported to be a problem on some longer slopes.

3. Considerable difficulty with grassy weeds has hampered production.

Recommendations

2.33 The Msimba farm is in position to operate as planned but can benefit from the general adjustments earlier recommended--especially those related to personnel and machinery and equipment procurement. Other specific recommendations are as follows:

1. Expedite construction of the improved, all-weather road to the farm. Fortunately, the same road can provide good access to the Ilonga ARI. The survey team did not explore sources of funding for the road improvements. It was assumed that USAID and TanGov already are aware of alternative possibilities.

2. Delay any investments in drainage, erosion control, and irrigation until a complete water management plan is developed for the entire farm unit, using TDY assistance as earlier recommended.

3. Check on the current availability of chemicals and other control methods for the most troublesome grassy weeds. If none are currently available, consider joint experimental work with the Ilonga ARI to discover more effective controls.

   In connection with overall water management and layout planning, a complete, longrun cropping system should be developed, considering the possibility of more effective weed control by adjusting crop sequences in rotations. While not stated in Chapter X, TDY assistance from an agronomist with long experience in Seed Farm management might be requested.

Arusha Seed Farm

2.34 The Arusha Foundation Seed Farm is located approximately eight miles from Arusha. It comprises 1,200 acres of the Arusha Plantation which included 2,200 acres. The farm was formerly operated by NAFCO as a coffee plantation and a dairy business with supporting pasture land. The soil is derived from volcanic ash which leaves it subject to both wind and water erosion. Since the soils are of recent volcanic origin, they are very high in macroelements and have a high productive potential. However, soil analyses reveal a deficiency in manganese. The water holding capacity of this soil is low.

2.35 The climate of the farm is influenced by elevation and position relative to Mount Meru. Elevation ranges from 4,800 feet on the southwest to 5,300 feet on the north. Rainfall averages 32 inches per year with the north half of the farm receiving about 10 percent less than the southern half. Rainfall can be quite erratic from year to year. The average temperature is around 20°C. The coldest months of June, July, and August drops down to an average of 16.5°C.

2.36 A complete set of buildings has been built on this farm. This includes houses, an office complex, a machine workshop with room for spare parts, a seed dryer, and a seed processing plant. A domestic water pipe line and storage tank furnishes water for the permanent personnel. The seed processing plant is equipped to clean seeds of food grains, forage grasses, and legumes.

2.37 An irrigation sprinkler system was designed and purchased for 200 acres. Failure to obtain water rights from the river and unsuccessful bore holes have delayed putting this system into operation.

Specific Constraints

1. Severe wind and water erosion during dry and wet periods;
2. Lack of a stable water supply for irrigation at critical growth periods;
3. Unsuitable rainfall and other climatic conditions for maize production on substantial parts of the farm;
4. Mechanical failures and high operating costs of the seed dryer currently in use; and
5. Lack of environmentally controlled storage for assuring a high quality reserve supply of different lines of breeder seed.

Recommendations

2.38 Aside from recommendations for the personnel and equipment problems earlier described, those for the Arusha farm are modest in scope:

1. Expedite development of a complete and comprehensive water management and field layout plan for the entire farm unit to facilitate erosion control, a systematic cropping system, and efficiency in field operations. Secure TDY assistance as needed;
2. Further explore possibilities for securing an adequate water supply for implementing the irrigation system, especially for sufficient acreage for high-risk crops such as hybrid maize;
3. Abandon the present seed-drying structure and redesign for some alternative use--perhaps for environmentally controlled storage for reserve supplies of breeder seeds. Construct in its stead, several metal bins, of suitable size and with perforated drying floors, for bulk grain storage. Acquire a portable seed dryer to be used with the new bins.

4. Increase grain storage facilities (in relation to item 3)--especially adding modest storage space environmentally controlled. The feasibility of converting the present grain drying building to such uses should be investigated.

5. Consider planting additional pollination rows to trap unwanted pollen, in order to reduce the isolation distances for maize production. Refer to suggestions in Appendix Section B, Annex V, paragraph 5.1.29.

The Dabaga Seed Farm

Situation

2.39 The Dabaga Foundation Seed Farm, of approximately 2,300 acres, was transferred from NAFCO late in 1977. It is located in the southern highlands, about 30 miles southwest of Iringa on a gravel road. The farm has been used as a mixed farm and it had included a dairy. Existing buildings included staff housing, office, workshop, processing plant, warehouse, and miscellaneous units. The buildings were in need of considerable repair. Electric power is supplied by a small generating plant and the only source of water comes from a surface water reservoir.

2.40 Soil on this farm, when managed well, has potential for high production using only minimal amounts of fertilizer. Annual precipitation is around 34 inches. This rainfall is effective because it is concentrated during the growing period. Temperatures range from 12-14^{o}C to 24-26^{o}C. The elevation is about 6,500 feet. The soils and climate make this farm suitable for the production of maize, wheat, and pyrethrum. Field trials might show that successful production of other cool season crops is also possible.

Specific Constraints

2.41 Dabaga farm is in the early stages of development and the needs are numerous. The general constraints and associated recommendations apply to this farm in a more pronounced fashion. This is a very good farm and can contribute greatly to the improved seed program. Specific constraints which most seriously restrict rapid development are as follows:

1. Lack of adequate staff housing (key personnel must have suitable living quarters on the farm for satisfactory farm operations);
2. Lack of key managerial and supervisory personnel, especially an agro-mechanic and an expatriate counterpart who is highly trained and competent;
3. Lack of service buildings and processing equipment;
4. Lack of some kinds of farm machinery and transport equipment;
5. Severe erosion problems on the sloping land (some existing terraces appear to be poorly planned and constructed); and
6. Inadequate water supply for domestic use and irrigation.

Specific Recommendations

2.42 The survey team recommends, as a first step in further development of this farm, that the AID Project Coordinator, the appropriate KILIMO officials, and the three seed farm managers make a careful evaluation of the facilities, equipment, and staffing at the Msimba and Arusha farms. Experiences gained from these farm developments should lead to more appropriate investments for Dabaga farm. While many developments need simultaneous attention, a suggested order of

urgency is itemized below:

1. Construction of staff housing to get managerial and agro-mechanic personnel adequately housed quickly;

2. Employ an expatriate (American) agro-mechanic quickly to assist with farm development and start training Tanzanian counterparts;

3. Develop a dependable domestic water supply for all staff housing and service buildings;

4. Acquire most urgently needed field and transport equipment--with as much standardization as possible in connection with the other seed farms to facilitate maintenance and ordering of parts;

5. Develop complete layout plans for both the land and the farmstead area before new buildings and field improvements are started (the TDY team suggested in Chapter X should be competent for both types of planning); and

6. Improve the road leading in to the farm headquarters.

2.43 In summary, the above three Foundation Seed Farms should be fully adequate for this component of the improved seed industry. USAID and TanGov should give high priority to getting all three farms operating efficiently at an early date, as recommended above.

2.44 The longrun success of the certified seed program, which is vital to improvement of food grain production in the country, can never succeed without maintenance of the purity and quality of the breeder seed and expanding it for TanSeed use in certified seed production. These are the functions the Seed Farms are designed to serve.

III. TANSEED--CERTIFIED SEED PRODUCTION

3.01 As shown concisely in Figure 1.3, TanSeed is the final link in the chain of events which moves improved varieties of seeds from the plant breeder to seed distributors and individual farmers. Specific functions of this vital link in producing and distributing certified seed are stated specifically in Figure 1.2.

3.02 The Tanzania Seed Company, Ltd. (TanSeed), was established in connection with the "Seeds (Regulation of Standards) Act, 1973." Members of the survey team were favorably impressed with progress made by TanSeed in fulfilling the assigned responsibilities, both in organization and in operation.

3.03 As shown on the map in Figure 3.1, the National TanSeed office is located in Arusha. Officers at the national level include Bakari Lusewa, General Manager; Prosper J. Mackey, Marketing Manager; and Lenn Budd, Seed Production Controller.

3.04 Three branch facilities for seed processing, storage, and distribution are located at Arusha, Morogoro, and Njombe. These branches were visited by team members who were favorably impressed by the up-to-date facilities and the apparent level of management. A new storage depot, with provision for some environmentally controlled storage, was under construction at Njombe when the plant was visited in early

April. Managers of branch offices include Mr. S. N. Nnko at Arusha, Mr. Kibadia at Morogoro, and Lewis K. Ngonyani at Njombe.

3.05 In addition to the branch plants, storage depots are either under construction or already operating at six locations shown in Figure 3.1. Others are planned for later construction at strategic points throughout the country. Two locations under consideration are at Tanga and Songea. Regions and parts of regions served from each branch and distribution depot also as shown in Figure 3.1.

3.06 Each branch depot will have an office and a godown with a minimum storage capacity of 1,000 tons. Personnel for each depot will include a manager (trained in the branch offices), a storekeeper, and security guards.

3.07 TanSeed acquires pure lines of foundation seed of the various varieties from the Foundation Seed Farms and arranged with contract growers for producing the certified seed under supervision. In 1978, certified seed was produced by 120 contract growers, with distribution as follows:

1. Large private and estate farms---------1/3 of total
2. Parastatal farms----------1/3 of total
3. State farms, including Foundation Seed Farms----------1/3 of total

3.08 Kinds of certified seed produced and approximate quantities produced in 1978 are summarized in Table 3.1, somewhat in order of volume produced. As indicated, maize and wheat are the certified seeds in greatest demand thus far.

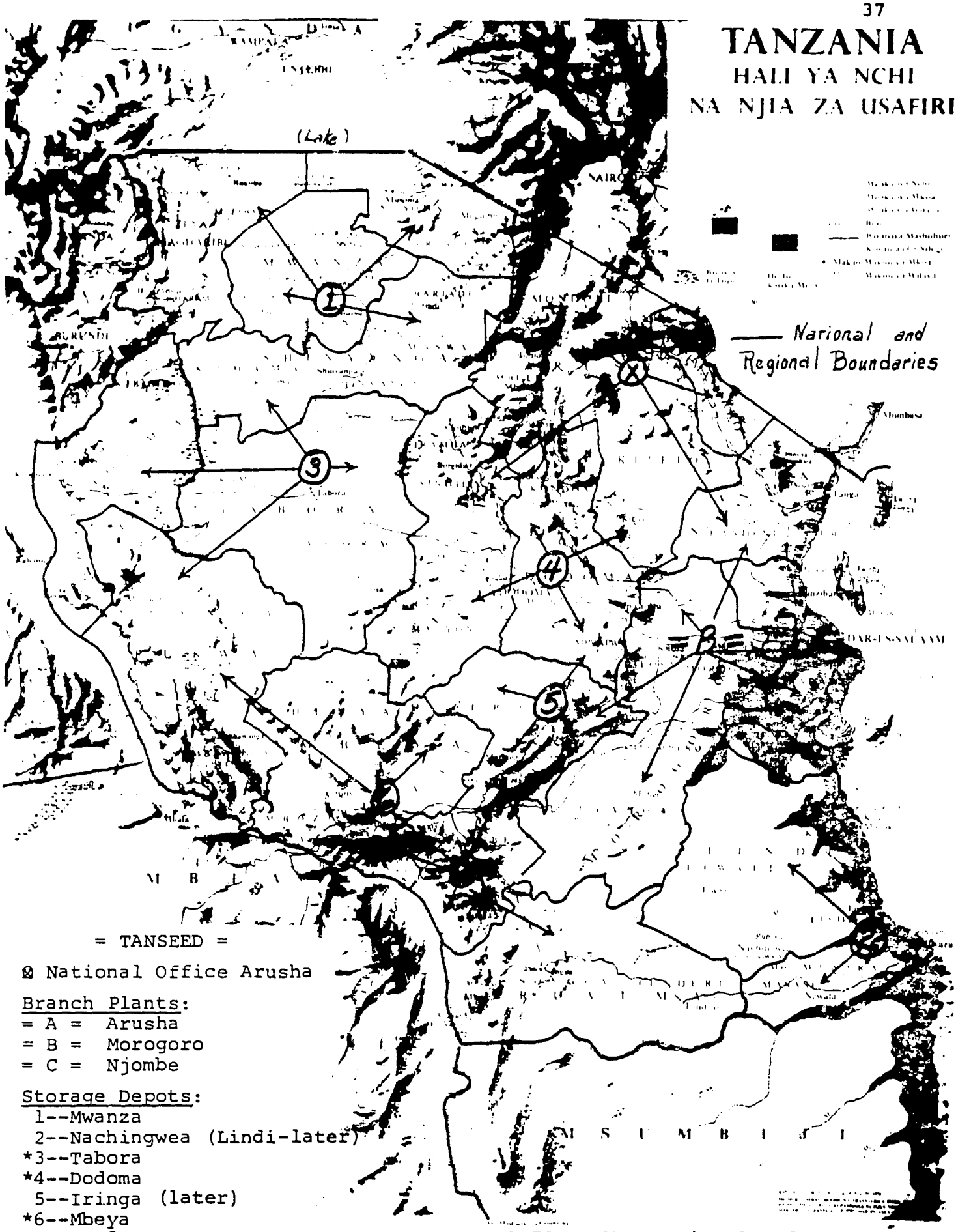

Figure 3.1 Location of TanSeed Facilities

Table 3.1--Approximate Quantities of Certified Seed Produced by TanSeed Contract Growers in 1978

Kind of Seed	Approximate Tons Produced in 1978
1. Maize--Hybrid	2,200
--Composites	1,000
2. Wheat	500
3. Rice (Paddy)	150
4. Sorghums	100
5. Field Beans	60
6. Sunflowers	40
7. Soybeans	15
8. Millets	40
9. Sesame (Sim Sim)	

Constraints

3.09 While good progress has been made by TanSeed, a number of constraints hamper operations to various degrees. Some major ones are itemized below and will be discussed in connection with recommendations.

1. Many contract growers do not produce certified seed with as much care as expected, with the quality sometimes in question;
2. Reliable marketing intelligence is not available for planning each year's production of various kinds of seed, and information often is received too late;
3. Problems may arise from grower contracts which seem more restrictive than necessary, and the contracts do not seem to provide for equitable sharing of liability for the purity and quality of seed produced from parental seed stocks;
4. Lack of environmentally controlled storage facilities for carrying over reserves of seed to insure against crop failures;
5. Insufficient processing facilities for an expanding demand for certified seed;
6. Difficulties in supervising large numbers of widely-scattered contract growers of certified seed; and
7. The exhorbitant costs of transporting seed from growers to processing plants and on to distribution depots.

Recommendations

3.10 Some suggestions for alleviating the above constraints are keyed to the itemized list above.

Recommendation No. 1

3.11 This recommendation relates to constraints numbered 6 and 7. Conduct training schools for contract growers on proper methods of growing certified seed. Attendance at such

schools could be made mandatory for contract growers who are accepted. The schools could be arranged during off seasons when field work is not pressing.

3.12 Assistance in conducting the schools might be received from staff members of the Seed Labs, of TOSCA, and of nearby ARIs and MATIs. Aside from helping identify weeds and off varieties, the cooperative training efforts will help strengthen the linkages discussed in Chapter IX.

Recommendation No. 2

3.13 This suggestion applies to constraint numbered 2, for which more detailed suggestions are given in Chapter VIII. Briefly, no method can be devised for accurate predictions of certified seed demand. Too many factors influence the demand by seasons, areas, and prevailing economic circumstances. A discounting procedure for regional estimates of quantities needed will need to be developed and improved over time. Implementation of improved extension programs over time, as suggested in Chapter VII, is probably the most hopeful method of gaining more accurate estimates of effective demand.

Recommendation No. 3

3.14 It is suggested that TanSeed officials confer with selected contract growers about adjustments to make contracts more equitable and acceptable to all parties concerned.

Recommendation No. 4

3.15 Over a period of time, it is recommended that an environmentally controlled storage structure be provided at

each of the branch plants--structures to hold seed at temperatures of 5 to 10°C and at 40 percent relative humidity levels

Recommendation No. 5

3.16 As recommended earlier, it seems wise to discontinue processing certified seed with Foundation Seed Farm facilities. As a matter of fact, TanSeed officials advised that this is not being done in 1978-79. It is suggested, however, that longer-range planning include installation of processing facilities at some of the branch depots. Equipment and storage comparable to that of the plants at Arusha, Morogoro, and Njombe would be desirable.

3.17 Aside from providing capacity to handle an expanding certified seed industry, the branch facilities might help make substantial reductions in transport costs. If seed could be grown, processed, and distributed to farmers within given areas, substantial savings might be realized.

Recommendation No. 6

3.18 It is recommended that efforts be made to concentrate certified seed production on fewer and larger farm units. Also, it is suggested that such larger contract growers be concentrated as near as possible to branch plants and depots (as explained above) where processing and storage facilities are available.

3.19 Aside from large farms already in use, consideration should be given to working out arrangements with Regional Seed Farms (already under development in some regions)

to serve as contract growers for TanSeed. This would go a long way toward achieving a coordinated, nationwide improved seed industry to serve the needs of an expanding agriculture.

3.20 With larger farms such as described above, the tasks of training and supervision could be greatly simplified.

3.21 Outside, donor financing might be secured to expedite development of some of these added facilities. For example, the World Bank is considering capital investments for improved seed production and processing in connection with the Mwanza area Regional Development Project. The Bank might consider assisting in a way, such as this, to achieve a better coordinated seed industry, nationwide.

3.22 The survey team recommends that TanSeed continue to arrange with contract growers for certified seed production, rather than attempting to establish and operate their own seed farms. The reasons are as follows:

1. Attention would be diverted to all the farm operating problems rather than concentrating on producing and processing high quality seed;

2. Substantial capital investments would be required for machinery and equipment;

3. Acquiring competent managers for the large seed farms would create difficulties; and

4. Supervision of managers and workers would further complicate TanSeed operations, and unnecessarily so.

3.23 In summary, TanSeed plays a vital role in the Improved Seed Industry in Tanzania and the survey team recommends that support for future development be considered along with the needs for the Foundation Seed Farms and the seed laboratories.

IV. THE SEED LABORATORIES AND TOSCA

4.01 As indicated in Figures 1.1, 1.2, and 1.3, the seed testing laboratories and TOSCA (the Official Seed Certification Agency in the Ministry of Agriculture) play an important role in the seed certification program. They are responsible for monitoring the work of the Foundation Seed Farms and TanSeed from the standpoint of quality control, maintaining the proper germination and purity of seed varieties, and freedom from harmful pathogens.

4.02 The National Seed Testing Laboratory and TOSCA were authorized by the 1973 Seeds Regulation Act. The National Laboratory and Headquarters of the Chief Certification Officer of TOSCA are located at Morogoro. A branch laboratory already is in operation near Arusha, adjacent to the Tengeru MATI. A second will be located in the southwest highland area of Tanzania, either at Njombe or Mbeya. Both laboratories were visited by the survey team, as well as tentative locations for the third to be established. (Fig. 4.1)

4.03 The National Laboratory can serve additional functions. It is located on the College of Agriculture campus where research and training can be conducted and coordinated. In addition to seed quality control activities, it will serve as Tanzania's referee laboratory to which seed samples in dispute are referred for testing.

4.04 By necessity, the work of TOSCA and the laboratories are closely integrated. Responsibility for seed test-

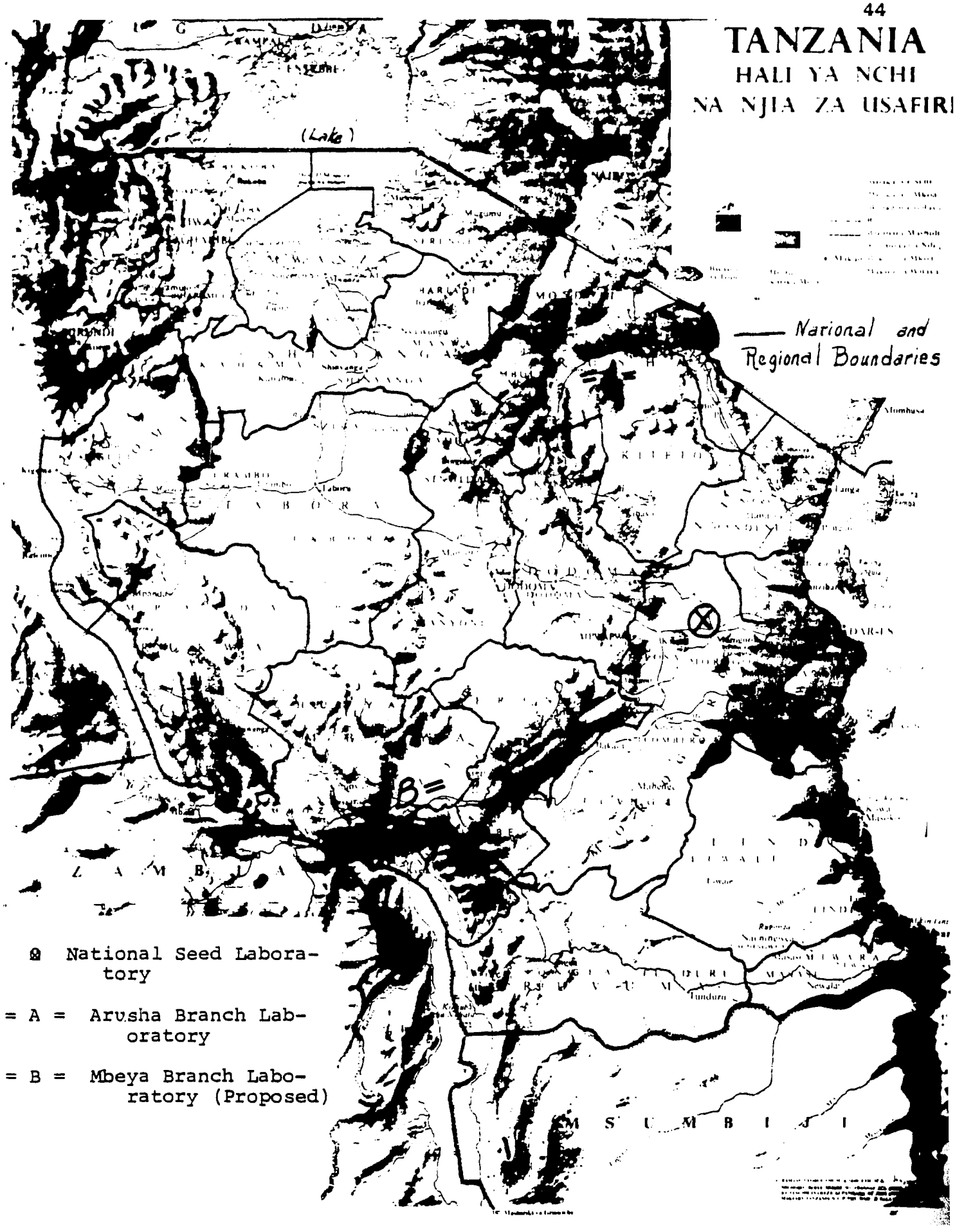

Figure 4.1 Location of Seed Laboratories

ing for germination and purity and for identification of weeds, off varieties, parasitic plants, plant diseases, etc. requires close coordination of field inspections with laboratory evaluations. Since both activities are seasonal in nature, some staff members of the laboratories assist with field inspections during rush periods. In addition to greater efficiency in the use of personnel, the field inspection work keeps laboratory technicians better informed about all aspects of quality control.

4.05 The staffing designed for the Morogoro and Tengeru laboratories is one senior inspector/analyst with a bachelor degree and specialized seed laboratory training; two inspectors/analyst diploma holders; and three technician certificate holders. The Njombe/Mbeya laboratory would have one senior inspector/analyst; two diploma holders; and two certificate holders. The two laboratories in operation are understaffed and additional support would add to the vitally needed strength of this program. The Seeds Act of 1973 provides for a "Chief Certification Officer," a "Chief Inspector," as well as a "Chief Analyst." At present these positions are under the responsibility of one person.

4.06 The activities of both the laboratories and TOSCA have been delayed and hampered by a number of constraints. Some of the more crucial ones are itemized below, along with recommendations for alleviating them.

Constraints

4.07 Some of the most troublesome constraints are as follows:

1. Delays in equipping and starting operations in the new National Laboratory building at Morogoro;
2. Inadequate training and supervision of laboratory technicians and field inspectors;
3. Shortage of field inspectors required for timely inspections; and
4. Insufficient transport for the laboratories and for TOSCA Field Inspectors.

Recommendations for Quality Control

4.08 The quality control functions of the improved seed industry will be seriously hampered until a few major adjustments and additional investments are made. Those most urgently needed are summarized below.

Seed Laboratory Recommendations

4.09 The new laboratory building on the College of Agriculture campus at Morogoro has been essentially complete for many months and most of the needed equipment is in the building in crates and cartons. However, after many months of waiting, the contractor has failed to put in the necessary benches and work tables for the equipment and the cold storage row needs reworking of side walls and installation of refrigeration equipment.

4.10 The following actions are recommended for early attention:

1. Give the building contractor a definite date for having all of building work completed (if requirements are not met, hire another contractor at the initial contractor's expense);

2. Secure the necessary help to transfer all equipment to the new building and start the new laboratory operations at the earliest possible date;

3. Complete the staffing as indicated above. The present senior inspector/analyst was trained at Mississippi State University and seems highly competent. A check should be made to see if other present staff members have adequate training for other positions;

4. Acquire two four-wheel drive vehicles for the national office and one each for the two branch labs;

5. Request the prompt arrival of an expatriate seed analyst/laboratory management specialist as provided for in the Experience, Incorporated, contract. He will be needed for a one to two-year assignment. His primary responsibility will be to assist in organizing and training personnel in seed certification procedures and seed testing. The present chief certification officer, Joseph Mallya, seems competent but his training is in plant pathology. He expressed an urgent need for assistance from an expatriate with the above qualification; and

6. Locate and install the second branch laboratory as soon as possible. Location on land adjacent to the Uyole Agricultural Institute at Mbeya is recommended for the following reasons:

   a. adequate Institute land is available;

   b. a major highway provides excellent accessibility;

   c. it is conveniently located for the southwest highland area;

   d. cooperation with the Uyole ARI staff would be facilitated; and

   e. the MATI Director, Mr. Khimiti, is willing to assist with arranging special training courses and conferences.

TOSCA Recommendations

4.11 The following actions are recommended for alleviating shortcomings in TOSCA operations:

1. Add additional, well-trained field inspectors to permit field inspections on a timely basis. From three to five will be needed as the program expands;

2. Provide a four-wheel drive vehicle for each field inspector (he must be able to get to fields at the proper time, regardless of weather and road conditions); and

3. Provide an expatriate field inspection/training officer on a one to two-year assignment to work with the Chief Certification Officer. His primary function would be staff training--in schools, short courses, regular conferences, and on-the-job training with field inspectors.

General Recommendations

1. Concentrate on staff training. Heavy investments in buildings, laboratory equipment, vehicles, etc. may be wasted without competent people to use them.

   With careful planning and cooperation, this training can be coordinated with the College of Agriculture at Morogoro and the MATIs at Tengeru and Uyole.

V. THE TANZANIAN SEEDS ACT AND CERTIFICATION RULES

The Seeds (Regulation of Standards) Act, 1973

Situation and Constraints

5.01 The Seed Act became law in 1973. Regulations setting grade standards were adopted in 1976. Basically, the Seeds Act is well structured, although it may be more sophisticated than the present Tanzania technology. As now written, the Seeds Act has several objectionable and irrelevant provisions. For example, it

1. Contains some ambiguous statements and standards for crops not grown in Tanzania;
2. Sets grade standards for diseases not seed borne and which do not affect seed quality;
3. Sets regermination requirements based on experience in temperate rather than tropical climates;
4. Contains confused crop names and many obsolete species names; and
5. Has no provision for quality control.

Attempts to enforce the Seeds Act as now written, particularly with regard to diseases standards, has increased production costs by requiring unnecessary destruction of plants with diseases unrelated to seed quality, and caused the rejection of certified seed fields of acceptable quality.

Recommendations

5.02 Recommendations for correcting these deficiencies in the Seeds Act are given in Appendix B, Annex V. The rec-

ommendations do not change the basic structure of the Seeds Act. They should aid in correcting many of the deficiencies listed above. If adopted, some of the present confusion could be avoided and enforcement enhanced. When amended and judiciously enforced, the Seeds Act will benefit the seeds industry and the farmer.

Rules, Regulations and Certification Procedures Tanzania Official Certification Agency (TOSCA)

Note: It is recommended that the word "seed" be inserted to make this read Tanzania Official Seed Certification Agency (TOSCA) since the term is currently in use and describes the Agency more explicitly.

Situation and Constraints

5.03 Seed certification in Tanzania was authorized by the 1978 Seeds Regulation Act. Enforcement is by the Tanzania Official Certification Agency in the Ministry of Agriculture. Headquarters of the Chief Certification Officer is at Morogoro, with sub-headquarters at Arusha. A National Seed Testing Laboratory has been developed at Morogoro, with a branch at Arusha, and a branch planned at either Mbeya or Njombe. (The team recommends the Mbeya location for reasons stated in Chapter IV.)

5.04 The basic structure of the seed certification rules and procedures is sound. As with the Seeds Act, some provisions appear to be overly strict, which if enforced would increase production costs of certified seed and cause occasional rejection of seed of otherwise acceptable quality.

Modifications and changes need to be made in line with the changes recommended in the Seeds Act.

5.05 The rules, regulations and procedures for seed certification are deficient in that no quality control program is required. This does not provide the breeders, the Foundation Seed Farms, TanSeed, and the seed inspection officials, an opportunity to monitor uniformity in quality among different seed growers. A properly developed quality control program would:

1. Provide field inspectors with information on purity of different seed lots prior to the field inspections;
2. Monitor uniformity of seed quality among different certified seed growers;
3. Monitor uniformity of field inspections among different field inspectors; and
4. Provide an official reference sample in case of legal disputes.

5.06 Detailed and specific recommendations for corrections and modifications in the Seeds Act and Certification Rules are included in Appendix Section B, Annex V.

VI. RESEARCH AND DEVELOPMENT FOR CROP PRODUCTION

Part B

General Purpose

6.01 The objective of this team was to survey the Tanzania seed industry.

6.02 The scope of work called for:

1. Review of the multiplication and distribution of certified seed;
2. Identification of bottleneck and constraints; and
3. Suggestions to remove the constraints.

6.03 In addition to the inefficiencies and constraints within the seed multiplication and distribution systems, there are also external constraints since the seed industry does not function in isolation.

6.04 For a seed industry to flourish there needs to be:

1. A crop breeding research program to provide an even flow of improved varieties;
2. Proven and economical cultural practices, which include fertilization and pest control, if the improved varieties are to produce optimal yields; and
3. An educational system that will communicate relevant and proven research recommendations for improved varieties and cultural practices to the farmer.

The purpose of this chapter is to examine the research and formal educational system and to point out constraints in the system that adversely affect the spread of good seed. The marketing and extension programs are discussed more fully in Chapters VII and VIII.

Agricultural Research and Teaching in Tanzania

6.05 Agricultural research and teaching in Tanzania involves the following components:

Agricultural Research Institutes (ARIs)

6.06 The Ministry of Agriculture maintains 9 Agricultural Research Institutes (ARIs) and 23 agricultural experiment sub-stations which conduct crop research activities. Six additional ARIs conduct animal research.

National Crop Research and Planning Committees (NRPC)

6.07 Coordination of research between institutes is accomplished through 17 "Specialist Research Coordinating Committees," based upon either commodities or research disciplines, with representation from ARIs, extension, parastatals and regions.

IITA/USAID-T Agricultural Research Project 107

6.08 The objective of this project, which is conducted by IITA on contract with USAID, is to stimulate production of maize, sorghum, millet, grain legumes and root crops through technical assistance and participant training. Linkages have been established with CIMMYT on maize and ICRISAT with sorghum and millet.

Other Donor Institutions

6.09 In addition to the IITA/USAID Agricultural Research Project, donor assistance is received on many proj-

ects. Those related to food production include, among others:

Wheat Research Institute, Lyamungu (Canada)

Uyole Agricultural Center, Mbeya (Nordic)

German Assistance Program in development of experimental facilities at Katrin (now terminated)

British Aid in Oil Seeds

FAO National Soils Project

National Scientific Research Council (NSRC)

6.10 The NSRC coordinates all research in Tanzania, advises the government on research priorities, and recommends allocation of funds according to priorities.

Faculty of Agriculture, Forestry and Veterinary Science, University of Dar es Salaam, Morogoro

6.11 The Agricultural Faculty, Morogoro, is the only institution that offers the B.S. degree in agriculture in Tanzania. It also offers the M.S. and an occasional Ph.D. degree. Limited research is conducted by individual teachers. The Faculty at Morogoro is under the Ministry of Education rather than the Ministry of Agriculture.

Ministry of Agriculture Training Institutes (MATIs)

6.12 The Ministry operates 10 training institutions, generally located in close proximity to an ARI. The MATIs grant certificates and offer 2-year diploma programs. Research is not conducted at the MATIs.

6.13 These agricultural research and teaching institutions are discussed more fully in Appendix Section B, Annex VI.

Constraints to Agricultural Research and Teaching in Tanzania as Related to the Seed Industry

6.14 Several constraints within the agricultural research and teaching system seem to hamper the building of a viable seed industry:

1. Paucity of resources: trained manpower and funds;
2. Isolation of the Faculty of Agriculture, Morogoro, from the ARIs, the MATIs, and the Extension Service;
3. Overabundance and dispersion of the ARIs;
4. Isolation of the ARIs from the Extension Service and the teaching programs (MATIs and Faculty of Agriculture); and
5. Utilization of expatriates to conduct programs rather than to develop capacity of Tanzanians to conduct programs.

6.15 These constraints are discussed in Appendix Section B, Annex VI.

Recommendations to Overcome the Constraints in Agriculture Research and Teaching in Tanzania

6.16 Solutions to the constraints listed above will not come easily nor be realized quickly. Many involve government policy decisions about the infrastructure, each of which will have long range effects on a host of related problems. It is the opinion of this team that research and manpower to maintain a viable breeder/Foundation/certified seed industry will

not be forthcoming until steps are taken to integrate the research/extension/teaching system and make it more relevant to the farmers' problems. It is realized that implementation of the recommendations are beyond the scope of the Seeds Program.

Paucity of Resources: Trained Manpower and Funds

6.17 Competition for students and high costs will necessarily limit the manpower training for research, extension, teaching, and positions in the seed industry. Two major suggestions are offered in regard to manpower training and its conservation.

1. Protect the investment made in manpower training by establishing working conditions and pay scales that will hold the returning trainee in the position for which he was trained. These include:

   a. Upon return the trainee should be given a position in the area in which he was trained;

   b. He should be rewarded by salary and benefits commensurate with positions requiring similar skills in other governmental agencies or parastatals; and

   c. He should receive regular promotions in his position so that he will not be seeking other jobs with higher pay.

2. Upgrade the M.S. and Ph.D. programs at Morogoro so that more students can be given a better education at home. This would increase the supply of trained manpower and reduce the number of students to be sent abroad.

6.18 Financial constraints covered by shortages of research and teaching funds may be expected to persist for a long time. Steps need to be taken to make major economies in research and teaching programs so that expenditures will be stretched as far as possible and be used more efficiently. Some steps to accomplish this include:

1. Consolidation of present research and/or teaching staff, facilities, and programs;

2. Multiple uses of facilities and staff; and

3. Termination of non-productive ARIs, experimental farms and teaching facilities.

Isolation of the Faculty of Agriculture, Morogoro

6.19 The Faculty of Agriculture, Morogoro, should be the apex of the research and teaching systems. It is the only institution awarding B.S., M.S., and Ph.D. degrees. Major benefits would accrue from upgrading Morogoro to this status. These are:

1. A major step in solving the manpower shortage could be made by upgrading the B.S., M.S., and Ph.D. programs at Morogoro as discussed above;

2. Major economies could be made by establishing central pathology, entomology, and weed science laboratories that would service the entire research system and avoid expensive duplication at the different ARIs;

3. A central agricultural library could be established which would service the ARIs (only minimal journals and books would then need to be duplicated at the different ARIs);

4. The Seed Certification Services and the Central Seed Testing Laboratory are already located at Morogoro (this team is proposing erection of an environmentally controlled central storage for basic Breeder Seed Foundation seed stocks. The same facility could serve for long term storage of breeder seed stocks and germ plasm collections);

5. Interchange between teachers and research workers would result in more knowledgeable teachers and graduation of students with more current information; and

6. Graduate thesis studies could be assigned on relevant research projects (this could be facilitated by bringing Research Specialists to Morogoro where they could assist in teaching and advising graduate students).

6.20 Ways need to be found to accomplish these objectives so that research at Morogoro can be integrated and coordinated with research in the ARIs. Meanwhile, cooperation could be initiated by assigning graduate students to conduct their research in an ARI with assistance from a research worker in the ARI, who would advise the student jointly with his adviser at Morogoro.

Dispersion of the ARIs

6.21 The dispersion of the ARIs geographically and through commodity orientation has these adverse effects:

1. Fosters duplication of staff and facilities;
2. Hinders interchange of ideas among scientists working on similar problems with different crops;
3. Spreads thinly already meager laboratory and library facilities; and
4. Isolates the research worker from his colleagues at Morogoro, other ARIs, the MATIs, the field extension worker, and the farmer.

6.22 Concentration of research activities by reducing the number of ARIs and elimination of subsidiary experiment stations (non-productive in research) would permit diverting manpower and funds now spent on their maintenance to productive research.

Isolation of the ARIs from the Extension Service and the Teaching Program (MATIs and Faculty of Agriculture)

6.23 In the past, the ARIs were almost completely isolated from the Extension Service. This lack of communication resulted in research findings not being disseminated to the

farmer, and the farmers problems were not called to the attention of the research workers so that they could keep research relevant. This lack of communication is recognized by KILIMO and steps are being taken to develop a research/extension linkage. This move is laudable and deserves full cooperation of USAID. In the longrun, support of improved ARI research programs and improved ARI/extension linkages can have a greater effect on the success of the seed industry than putting out fires to increase efficiency of the present seed multiplication program.

6.24 One important element left out of the research/extension linkage is the teaching programs.

6.25 It is recommended that the MATIs along with the Faculty of Agriculture, Morogoro, be represented, making a tripartite linkage research/extension/teaching.

6.26 The case for the Faculty of Agriculture, Morogoro, has already been stated.

6.27 The reasons for bringing the MATIs into the linkage are:

1. While the extension representative on the research/extension/teaching liaison group would be assimilating research findings and passing relevant research information onto the extension worker, the MATI representative would be assimilating relevant research findings that would aid the MATI teachers in keeping their teachings current and relevant;

2. The Extension Service obtains most of its extension workers from the MATIs. More relevant teaching would improve the quality and training of the MATI graduates that enter the extension system; and

3. Keeping MATI teachers current and aware of relevant problems would enable the Extension Service to call

on the MATIs to conduct short courses, training seminars, and workshops for the extension staff, certified seed inspectors, seed industry personnel, farmers, and other groups.

6.28 Eventually locating the research/extension/teaching liaison group at Morogoro would make the expertise of the faculty available to the liaison group and bring to the attention of the faculty relevant problems for which research is needed.

Utilization of Expatriates to Conduct Programs Rather Than Training Tanzanians to Conduct Programs

6.29 Emphasis on training people to organize, manage, and develop expertise to make valid judgments should be the major goal of every expatriate, whether it be a Seeds Project, a Research Project, or a Country Development Project. The colonial powers left little behind in the way of an educational system and few trained, educated people. USAID should not make the same mistake. A trained person will make better contributions to Tanzania than flowery annual reports or articles published in research journals.

6.30 The recommendations for alleviating the constraints are discussed more fully in Appendix Section B, Annex VI.

VII. EXTENSION: EDUCATIONAL AND PROMOTIONAL PROGRAMS

Situation

7.01 Widespread use of high quality seed of improved varieties can have profound effect on the production of food grains in Tanzania. As explained in earlier chapters, the structural framework for the Tanzanian seed industry provides for developing, maintaining, certifying, and distributing pure varieties of seed for major crops. However, little increase in production can accrue unless farmers use the improved seed--along with proper soil treatments, plant protection, and other good cultural practices.

7.02 This so-called "package approach" of integrating other good farming practices with the use of improved seed for more productive farming systems represents a major departure from traditional farming methods. In Tanzania, as in most other countries, responsibility for teaching farmers how to adjust to new farming methods has been delegated to the extension service.

7.03 It is the general consensus, as revealed by numerous reports and personal conferences with regional staff personnel, that extension has been relatively ineffective in carrying out this assignment--for reasons later described. This situation prevails despite large numbers of village extension workers employed. (Exact numbers cannot be ascertained accurately because of frequent personnel turnover but

some reports indicate an authorization of 6,000 to 8,000 positions.)[1/]

7.04 One assignment for the survey team was to evaluate the existing extension service from the standpoint of major constraints and to suggest modifications to enhance its performance in encouraging and promoting the widespread use of improved seed and related technology. A specific suggestion was to develop a model program for one region, such as Arusha, to serve as a working pattern, or pilot study, for guiding adjustments in other regions.

7.05 After arrival in Tanzania, team members were informed about pilot studies of this nature already in progress in connection with the Uyole Research and Training Center near Mbeya, assisted by the NORDIC group, and in the Tanga region as a part of the Tanzanian-German Integrated Rural Development Program (TIRDEP). In-depth consultations with staff members directing these programs were arranged and their organizational and operational experiences are related to proposals for the Arusha region. A similar project was reported to be in progress in the Mtwara/Lindi area with British assistance, but time restrictions precluded a visit to that area.

7.06 Organization of this chapter includes three major parts--a brief statement of major constraints, a description

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[1/] C. Brice Ratchford, William F. Murphy, and Lloyd E. Cavanah. Tanzania Seed Industry Survey. Interim Report, January 1979. Page 41.

of four structural and functional models for improved extension programs, and a concise summary of recommendations. More detailed explanations and supportive data are included in Appendix Section B, Annex VII.

Constraints

7.07 Many problems and constraints hamper an effective extension program in Tanzania as in most developing countries. Seven which are considered most detrimental are outlined below, somewhat in order of their severity and need for urgent attention.

Instability of Staff Tenure

7.08 Frequent turnover in personnel is one of the most disruptive problems afflicting extension efforts in Tanzania. In fact, development of a successful extension program probably can never be achieved until greater stability in assignments can be accomplished. This problem is especially troublesome among village extension workers but hinders performance at the district and regional levels as well.

7.09 The nature and magnitude of the tenure problem and some of the causes are documented in Appendix Section B, Annex VII.

Linkages with Subject Matter Information

7.10 Aside from being inadequately trained and new on the job, most bwana shambas have little information to extend. The DADO supervisor also may be new on the job, may

lack adequate subject matter training, probably is overloaded with administrative details, and most likely has no vehicle for transportation--especially one suitable for adverse weather and road conditions. The local extension worker is far removed from the researcher with little opportunity to communicate his problems and to receive guidance and assistance.

Staff Training

7.11 As indicated in Annex VII, some village extension workers have only . secondary education, others have certificate training, and only a few have diploma-level training.

7.12 The greatest training shortcoming, however, seems to be the lack of sufficient in-service training on a continuing basis.

Inadequate Staff Supervision

7.13 Staff supervision is difficult to initiate and maintain, largely because of insufficient transport and personnel problems earlier described.

Shortage of Transport

7.14 Most extension field work is hampered severely by very limited transport facilities. This restricts field supervision by DADOs and RADOs and hinders the work of bwana shambas, many of whom serve several villages.

Limited Farmer Involvement

7.15 Longtime extension experience shows that farmers are most receptive to new technologies and farming systems when they are actively involved in planning and carrying out recommended changes. Few have had opportunity to do this because of restrictions itemized in this section.

Insufficient Demonstrations

7.16 Method demonstrations to show how to apply new practices and farming methods and result demonstrations to show the consequences are at the top of the list in motivating farmers to change. And yet, in Tanzania, relatively few demonstrations have been started and many of them have not been followed through to completion.

7.17 Attention is directed to Annex VII for more thorough discussion of these constraints.

Structural Models for Improving Extension Programs

7.18 Four different models for improved extension programs are described and illustrated in Appendix Section B, Annex VII. All four models have desirable features with an attempt to coordinate the most promising ones in the Arusha model shown in Figure 7.4.

7.19 The National Model, shown in Figure 7.1, features research/extension liaison officers in connection with ARIs and MATIs and extension subject matter specialists at both

regional and district levels over a period of time. It also provides for coordination in KILIMO through a National Director and appropriate staff members.

7.20 The Mbeya (Uvole Agricultural Center) Model has been in operation since 1973 and seems to be making excellent progress but some work has been restricted because of constraints as discussed above. One unique feature is a Zonal Extension/Research Liaison Committee, representing the four regions of Mbeya, Rukwa, Iringa, and Ruvuma. This committee includes staff members of the Uyole ARI and MATI, the RADOs, and other officials from the four regions, and other professional workers such as the Nordic group. This Zonal Committee serves as a planning and coordinating group and arranges such activities as zonal and regional short courses, workshops and seminars; special field days and tours at the Uyole Agriculture Center at Mbeya and other locations; special training programs through the MATI; and other training and promotional efforts. The organizational structure and the functional flow of information and problem identification are explained more thoroughly in Appendix Section B, Annex VII and are illustrated in Figure 7.2.

7.21 The Tanga Model (TIRDEP) places heavy emphasis upon training activities, demonstrations, and providing facilities for more effective implementation. It is one segment of the German-sponsored Regional Integrated Rural Development Project and has many desirable features explained more fully in Annex VII. The structural organization is shown in Figure 7.3.

7.22 The Arusha Model is designed to integrate several desirable features from the other three models--such as regional and district Research Extension Liaison Committees, regional and district subject matter specialists, and a two-way flow of information from the research and training officers, to the RADO and his specialist staff, to the DADO and associated specialists, and through them to the village extension workers (bwana shambas) and individual farmers. The reverse flow of information on problems and training needs can be channeled through the same system. This model is illustrated in Figure 7.4 and is explained more fully in Annex VII.

Summary of Recommendations

7.23 Recommendations for improving the extension program in Tanzania are embodied in the four structural models earlier described and in the associated discussion in Appendix Section B, Annex VII. Implementation of a number of these improvements in the near future is vital to the Tanzanian seed industry.

7.24 Heavy commitments of capital and highly trained personnel for researching, expanding, certifying, processing, and distributing high quality seed of improved varieties are wasted efforts unless farmers use the seed. World-wide experience teaches that demonstration programs are the most effective method of expanding the use of improved seed and associated agronomic and management practices. These, in turn, require a workable extension program.

7.25 A summary of recommendations for improving the Tanzanian extension program may be stated concisely:

1. Quickly adopt a national structural and functional model to help assure orientation and integration of extension with research, teaching, training, and farmer problems;

2. Develop national and regional policies which will help assure more stability of tenure for RADOs, DADOs, and bwana shambas;

3. Provide minimal transport equipment for extension workers as soon as possible--probably 4-wheel drive vehicles for the RADOs and DADOs and their associated specialists and either motor cycles or bicycles for bwana shambas;

4. Continue training and upgrading the competence of extension workers at all levels, with primary emphasis on in-service training through refresher courses, seminars, conferences, workshops, etc.;

5. Provide financial assistance for advanced degree training abroad for most promising young men who have the potential to become the researchers, technical specialists, and top administrators in future developments; and

6. Arrange for expatriate assistance, largely through TDY assignments, for the highly specialized types of in-country training in which adequate Tanzanian competence is lacking.

7.26 Overall, such adjustments should help assure a viable, expanding seed industry--the foundation for accelerating the production of top quality food and cash crops upon which the nation so greatly depends.

VIII. SEED MARKETING AND DISTRIBUTION

8.01 The seed marketing and distribution system in Tanzania is not uniform throughout the country. Governmental decentralization has assured regional differences. Supporting transportation, educational, and financial facilities--as well as the dominant agricultural crops--vary by region.

8.02 The vast majority of seed comes from traditional peasant-saving of past production. The seed which passes into the more formal distribution channels comes primarily from seed farms sponsored by regional governments and from contract growers for TanSeed. Little seed is imported.

8.03 Certified seed is available only from TanSeed which gets its foundation seed from the KILIMO Foundation Seed Farms. It is the certified seed portion of the seed system that is of major concern, for this is the part that must be made dominant if the seed industry is to make the contribution for which it is capable.

8.04 TanSeed moves certified seed from its contract growers through processing to depots and on to points in the regions. Usually the seed is given to TRDB and/or the regional government which tries to make the seed accessible to the farmer. (TanSeed is really a wholesaler.) Most certified seed is given as credit in kind.

8.05 Serious constraints do impede the rapid development of the marketing and distribution system of the certified seed industry.

8.06 The areas of constraint identified were associated with (1) trained manpower, (2) transport, (3) coordination, and (4) roads and storage. These are discussed in detail in Appendix Section B, Annex VIII.

8.07 The key recommendations to minimize the constraints and improve the seed marketing and distribution system are as follows:

1. Keep an assistant manager and assistant mechanic in training at each foundation seed farm at all times. If this is not done, the smooth flow of foundation seed will be vulnerable to unacceptable interruptions in the case of illness, accident, death, or transfer.

2. Provide a three-fold increase in quality control field inspectors and provide each inspector with a four-wheel drive vehicle. Quality control is vital and it cannot be done with too few and immobile people.

3. Provide for lengthened and assured tenure so that regional agricultural and other government personnel have time to organize and carry out their assignments. Without this, much input never results in output. This means a strengthening of KILIMO personnel authority and is a necessary condition for improving the performance of the seed industry complex.

4. Assure that regional seed farms be developed and operated only as a result of joint planning by regional authorities and TanSeed. The ultimate aim of regional seed multiplication farms should be to grow certified seed for TanSeed. If this is not done, regions will end up working at cross purposes with other efforts to get improved seed to the farmer.

5. Assist TanSeed in improving its distribution system by encouraging the design and development of accessible small-scale seed storage facilities which will allow the timely delivery of seed closer to the farmer who will use it.

IX. LINKAGES AND COORDINATION

Present Situation and Constraints

9.01 The need for greater coordination of agricultural research, extension, and teaching has been repeatedly stressed in this report. This need, at least with regard to linkage of research and extension, is recognized by the Ministry of Agriculture. In preparation for an "Agricultural Research Workshop" that was held in Arusha, 26 February to 3 March 1979, a committee was established to:

1. Prepare recommendations for reorganization of the agricultural and livestock research;
2. Establish linkages with the Extension Service;
3. Improve the library and documentation services; and
4. Find ways to implement these changes.

The recommendations were presented to the Arusha Workshop in three papers:

1. "The Position of Agricultural Research in Tanzania;"
2. "Research/Extension Linkage;" and
3. "The Role of Tanzania National Scientific Research Council and Its Implications to Agricultural Research."

The content of these papers has been referred to in Chapters VI and VII.

9.02 Under the proposed reorganization, crops and livestock would be separate autonomous research organizations. The Tanzania Agricultural Research Organization (TARO), which is responsible for the crops research, would have eleven Ag-

ricultural Research Institutes:

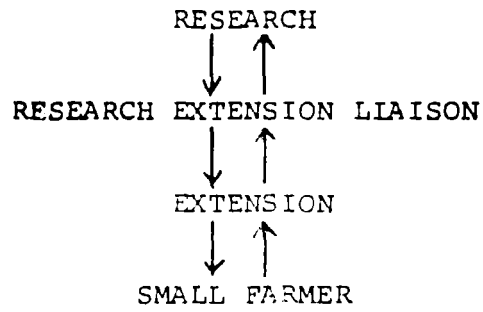
1. Lyamungu Research Institute
2. Ukiriguru Research Institute
3. Mlingano Research Institute
4. Sugar Research Institute (Kibaha)
5. Tumbi Research Institute
6. Tea Research Institute
7. Wheat Research Institute (Arusha)
8. Naliendelo Research Institute
9. National Institute of Horticulture (Tengeru)
10. National Institute of Food Crops Research (Ilonga)
11. National Institute of Agricultural Engineering

Each research institute will administer experiment stations. Several autonomous institutions (Uyole, National Hebarium) will be constituted as separate institutes. A summary of research stations and sub-stations where food crops research is to be carried out are given in Appendix B, Annex VI.

9.03 An important part of the proposed reorganization is to improve research/extension liaison. This proposed change has been referred in Chapter VI concerning the research programs and in Chapter VII on educational and promotional programs and will not be discussed here.

9.04 To this team, the heart of the proposed reorganization is the determination to develop a viable research/extension linkage. This linkage is designed to improve flow of information from the research worker to the user, the small farmer. Concurrently, it is expected that the small

farmer's problems will be communicated back to the research worker in order that he may address his research to relevant problems. Structurally, the proposed linkage would be established through a research/extension liaison group as follows:



Recommendations

9.05 We commend KILIMO for its assessment of the constraints to an effective research/extension program and the formulation of proposals to overcome these constraints. We recommend that USAID/T use all of the resources at its disposal to aid the Ministry in bringing about the desired improvements.

9.06 A major reservation on the proposed reorganization is that it does not bring in needed linkages with the teaching units. We are greatly concerned that the MATI's and the Faculty of Agriculture, Morogoro, were not brought into the research/extension liaison. (These linkages are proposed and demonstrated in the models included in Chapter VII.) A tripartite linkage, involving research/extension/teaching, is visualized and is considered strategically important.

9.07 The recommendation in Chapter VI, that the Faculty of Agriculture, Morogoro, should be the apex of the research/extension teaching tripartite liaison is reemphasized here with the suggestion that discussions be initiated to find ways to make this possible.

9.08 Some of the advantages would be as follows:

1. Economy, since senior research staff, expensive research laboratories, and library facilities would not need to be duplicated at each agriculture research institute;

2. Higher quality research, since the research workers would have access to improved laboratories and library facilities, and interchange among researchers in different disciplines which is impossible to duplicate at each research station (this would be improved by locating the research coordination at Morogoro);

3. More relevant research, due to the linkage with extension, and this might be the logical place to locate the research/extension liaison group; and

4. Higher quality graduates might be anticipated because their teachers, with linkages to the research/extension groups, would be more knowledgeable about the agriculture of Tanzania, and teaching would be more from experience and less from textbooks.

9.09 Development of Morogoro as the hub of the teaching/research/extension system would not lessen the importance of strategically located ARI's at which to conduct the field research. The large number of agri-climatic zones in Tanzania dictate the need for several locations. However, one may question whether 9 agricultural research stations and 23 substations or experimental farms can be justified, and more importantly, whether Tanzania can financially support this many stations at a productive level of research.

9.10 It is recommended that the field research be concentrated at as few research stations as possible, that these stations be upgraded insofar as resources permit, and that the other research stations be downgraded, and that many of the sub-stations currently used largely for seed production be eliminated.

9.11 More specific recommendations relative to research in Tanzania are included in Chapter VI and in Appendix B, Annex VI.

X. MANPOWER TRAINING AND ASSIGNMENTS

10.01 In developing countries, a major constraint to more rapid progress is the shortage of highly trained and competent manpower. This is true in Tanzania. This shortcoming is especially crucial in developing a viable and growing seed industry which will improve total productivity in the agricultural sector. The imperative need of the seed industry for top management and skilled labor--particularly for the Foundation Seed Farms--was well summarized by Dr. K. McDermott:

> Seed production enterprise is a sophisticated undertaking. It deals with biological processes that themselves set some rigid standards for operations. It also deals with sophisticated machinery and is exposed to risks of breakdown in the spare parts supply line as well as to human error. All of this requires a sustained and high level of management.[1/]

10.02 Four major types of manpower training are considered essential to help assure a viable and growing seed industry in Tanzania: (1) formal degree training--either in Tanzania or abroad--for key personnel for top scientific, technical, and managerial positions; (2) expansion and intensification of certificate and diploma training in the MATIs dealing with crop production, agricultural engineering and mechanics, farm management, and related fields--primarily a Tanzanian responsibility; (3) informal training of technical and managerial personnel through short courses, workshops,

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[1/] J. K. McDermott, Program Strategy Considerations for USAID/Tanzania, A Trip Report DS/AGR, October, 1978, page 29.

seminars, in-service training schools, etc.--primarily in-country but some of a special nature may be abroad; and (4) on-the-job, apprentice-type training through day-by-day activities under direct supervision of counterparts, either Tanzanian or expatriate.

10.03 All four types of training are essential and complementary. USAID probably will not be involved directly with certificate and diploma but might give encouragement and advice in any way possible. Estimates of the other types of training needed for different segments of the Tanzania Improved Seed Program are outlined below for possible USAID support during the next five years.

Classification of Degree Training Needs

Research and Training

10.04 Well-trained plant breeders and other scientists will be needed for expanding and upgrading KILIMO, the ARIs, the Faculty of Agriculture at Morogoro, Foundation Seed Farms, and TanSeed. Suggested five-year research staffing goals are outlined below. USAID may appropriately assist in the training necessary to reach these goals.

Degree	Subject Matter Field	Number Needed	Location
Ph.D.	Plant Breeding	7	1 - Kilimo 1 - Morogoro 5 - Crop ARIs
	Plant Pathology	2	1 - Kilimo 1 - Morogoro
	Agronomy	7	1 - Kilimo 1 - Morogoro 5 - Crop ARIs

Degree	Subject Matter Field	Number Needed	Location
	Agricultural Economics	2	1 - Kilimo 1 - Morogoro
	Entomology	2	1 - Kilimo 1 - Morogoro
M.S.	Agronomy	6	1 - Morogoro 5 - Crop ARIs
	Farm Management	5	5 - Crop ARIs
	Agricultural Marketing	5	5 - Crop ARIs
	Agricultural Engineering	5	5 - Crop ARIs
	Seed Technology	7	1 - Kilimo 3 - Foundation Seed Farms 3 - TanSeed

Seed Laboratories

10.05 The National Seed Laboratory at Morogoro, the branch laboratory at Arusha, and the third to be established in the Mbeya/Njombe area need highly competent personnel to assure quality control in the future seed industry. Suggested training for this segment follows.

Degree	Field Work	Number of Students
Ph.D.	Plant Pathology (at Morogoro)	1
	Seed Analysis	1
M.S.	Plant Pathology (for branch laboratories)	2
	Seed Analysis and Field Inspection	2
Foundation Seed Farms		
Ph.D.	Plant Pathology/Seed Analysis for Top Ministry Director	1
M.S.	Farm Management	6
	Agricultural Mechanization	6

Degree	Field Work	Number of Students
	Agricultural Engineering (irrigation, etc.)	3
	Seed Technology	3
TanSeed Operations		
M.S.	Agricultural Marketing	3
	Firm Management	2
	Accounting	2
	Agronomy	3
	Pest Management	3
Extension--KILIMO and Regions		
Ph.D.	Top KILIMO Administrator	1
	Top KILIMO Crop Scientist (Agronomist)	1
M.S.	KILIMO and Regional Staffs	2
	*RADO	15
	*Regional Specialists	30

*These positions and training should be integrated with the National Extension/Research Vitalization Program.

Assistance for Informal Training (Short courses, schools, apprentice-type, etc.)

10.06 Assistance with informal training may require the help of both direct hire and TDY personnel through USAID. Suggested personnel for each category are as follows:

Kind of Position	Total Time Needed	No. of Persons
Direct Hire Personnel		
1. Counterpart for Foundation Seed Farm Director	2 years	1

	Kind of Position	Total Time Needed	No. of Persons
2.	Counterpart for Foundation Seed Farm Manager	2 years	3
3.	Counterpart for Foundation Seed Farm Mechanics	2 years	3
4.	Counterpart for Seed Laboratory Director	2 years	1
5.	Counterpart for Chief Field Inspector	2 years	1

TDY Personnel

1.	Preparation of Plans for Water Management Systems for 3 seed farms (Urgent Need)	
	Agricultural Engineer	3 (2 stages)
	Farm Management/Planning Specialist	3 (2 stages)

NOTE: The Foundation Seed Farms need an overall coordinated water management/farm management plan developed by a team as above. Selection of this team from Missouri is suggested because agricultural engineering and farm management planning have been coordinated in a unique manner over a period of several decades.

2.	Training in Operation of Seed Processing Equipment	4 (2 stages)
3.	Training in Field Inspection for Seed Quality Control	4 (2 stages)
4.	Training in Extension Methodology	6 (3 stages)
5.	Training in Servicing and Repair of Farm Machinery and Equipment	6 (3 stages)

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XII. APPENDIX SECTIONS

APPENDIX - SECTION A

PROPOSED ANALYTICAL FRAMEWORK FOR PLANNING, IMPLEMENTING AND EVALUATING PROGRAMS AND PROJECTS

Some systematic and logical procedure for planning, implementing and evaluating programs and projects is considered essential for formulating proposals and carrying them out over time. The following ten-step process is suggested:

1. INVENTORY RESOURCES—Classify and evaluate the different kinds of resources on which the longrun agricultural development of the country depends.

2. ESTABLISH GOALS—Conceptualize and articulate the goals to be achieved through the plans and programs developed.

3. IDENTIFY PROBLEMS—Itemize major constraints which hinder attainment of goals.

4. ANALYZE ALTERNATIVES—Evaluate the pros and cons of different strategies for development.

5. CHOOSE A PLAN—Select a strategy for development which seems most appropriate for the resources available, for the current situation and stage of development, and for the planning horizon considered.

6. TAKE ACTION—Outline the most relevant actions, the programs and projects, which will help implement the chosen strategy in the most expeditious and effective manner possible.

7. ALLOCATE RESPONSIBILITIES—Assign responsibilities, along with authority for execution of plans, to those who will carry out various phases of programs and projects.

8. EVALUATE PROGRESS—Establish benchmarks as a basis for measurements and devise a continuing system of records, reports, and analytical procedures to aid in evaluating progress over time.

9. ESTABLISH CONTROLS—Set up administrative policies, procedures, and accounts to help assure the use of capital and other resources in accordance with development plans selected.

10. ADJUST—Incorporate sufficient flexibility in programs and projects to facilitate adjustments in case of unexpected events which either retard progress or hasten development.

APPENDIX SECTION B

ANNEX V. PROPOSED AMENDMENTS TO THE TANZANIAN SEEDS ACT AND CERTIFICATION RULES

Changes Recommended for the Seeds (Regulations of Standards) Act, 1973

5.1.01 The recommendations listed below refer to specific sections and pages of the Seeds Act.

Clarification of Ambiguous Statements and Deletion of References to Irrelevant Crops

5.1.02 Section 2, (Page 41): Reference to "flax" and "sweet clover" under "undesirable seed" are irrelevant to Tanzania and should be deleted. Reference to "alfalfa or clover" may not cover all forage legumes. Substituting "small seeded forage legumes" would cover a large number of species that may later become commercially important.

5.1.03 Section 7-3 (Page 43): Certified seed is pedigreed seed, in contrast to common seed. Paragraph (a) could be changed to read: "The Tanzania Seed Seal shall be applied to all Foundation, Registered, or Certified grades of pedigreed seed."

5.1.04 Section 8-6, (C), (i), (Page 44): Reference to "oats" and "flax" in this statement is irrelevant in Tanzania. "Triticale" could be added to the list.

5.1.05 Section 10-2, (j), (Page 46): The statement related to "a double cross hybrid" is ambiguous. Deletion of

"four unrelated homozygous strains or" is recommended. Four unrelated homozygous inbreds may be combined in ways other than would lead to the production of a double cross hybrid, which is the product of a cross between two single cross hybrids.

5.1.06 Sections 14 and 15 (Page 47): Paragraph (f), Section 14 and paragraph (c), Section 15, reference to sweet clover is irrelevant in Tanzania and should be deleted.

5.1.07 Section 15-2 (Page 47): To be consistent with Section 15-1, (C), above, 1 percent should be changed to 5 percent. One percent appears to be unnecessarily rigid.

Grade Standards for Plant Diseases

5.1.08 Disease Standards: Some of the diseases included in the Tables of Grade Standards, Tables 1, 2, 3, 6, 12, 13, 14, 15, 16, and 18 might be questioned. Diseases which are seed borne, and which may be transmitted through the seed to the succeeding crop, are definitely factors in seed quality. But before diseases are included in grading standards for seeds the following questions and factors need to be considered:

1. Is dissemination of the disease by infected or infested seed, by airborne spores to the growing crop, by insects (vectors), by other agents, or by a combination of agents? Unless the diseases are seed borne, there are no valid reasons for their inclusion in grade standards.

2. If diseases are seed borne, what are the economic risks to the farmer who plants the seed and what will be the probable extent of the yield losses he will sustain as compared to planting disease-free seed?

3. Is presence of the disease on the plant sufficient evidence that the disease will be seed borne? Some fungus diseases affect only leaves and stems and are only incidentally involved with seed infection. Some infectious agents affect the roots, but they are natural soil inhabitants. However, whenever there is evidence of an actual seed borne nature of a disease, then grade standards could be involved providing that the disease can be practically controlled by monitoring the seed supply.

4. Is there a positive and practical test that can be utilized to identify a particular disease in normal seed testing procedures?

5. Are there available effective seed dressings, such as fungicides, which can be practically and economically applied to the seed of otherwise acceptable quality that will reduce the disease losses of the succeeding crop to an acceptable level of risk and prevent loss to the seed industry?

5.1.09 The loose smut fungi infecting wheat (Ustilago tritici) and barley (Ustilago nuda) are special cases because spores are disseminated at time of flowering and the pathogen is deep borne within the seed. Percentage of infected plants is a good indication of percentage of infected seeds. Laboratory tests to identify infected seeds are available but not practical and are little used in normal seed testing operations. Seed dressings (e.g. carboxin "Vitavax" and "Vitavax 200") are available which effectively control loose smut (and other seed borne diseases at the same time). The entire question may be irrelevant in Tanzania since it is understood that loose smut has never been a problem in either wheat or barley.

5.1.10 A large group of the pathogens are included in the Grade Standards--Pyricularia oryzae and Xanthomoras oryzae on rice; Ascochyta sojaecola, Glomerella gylcines, and Macro-

phomina phaseoli on soybeans; and Xanthomoras malvacearum on cotton--are examples of fungi or bacteria which are normally disseminated by wind, water, insects, or other natural agents. Some, in addition, may be seed borne to a limited extent, as fungus spores or bacteria on the surface of the seeds. Seed dissemination of the fungus diseases is easily and practically controlled by fungicide seed dressings. Having seed free of pathogens does not prevent plants growing from that seed from being infected by natural agents in the field. These diseases should be deleted from the grading standards.

5.1.11 Seed borne virus diseases /groundnut rosette, tobacco mosaic virus (TMV), bean mosaic virus (BMV), Aster yellows (Aster yellows is a myco-plasma disease, not a virus), as examples/ cannot be controlled by seed dressings and rightfully should be considered as grading factors. Detection of a virus in seeds can only be done by "grow out" tests. Dissemination in the field may occur, normally through insect vectors from infected host plants, in some cases through infected seed. In crops in which these diseases constitute a problem, and resistant varieties are unavailable, disease free seed can be produced, but only in an environment in which natural vectors are absent. The presence and spread of each specific virus will need to be assessed under Tanzanian conditions before rational judgments on seed standards can be made. The extent or capabilities of the technology in Tanzania to make these judgments are not known. Standards for vegetatively propagated seed

stocks in the current law do not address the problem of virus diseases.

5.1.12 Nematodes (white tip nematodes in rice, Table 3; leaf eelworm and root knot eelworm, Table 16) are prohibited in one or more seed classes. A major means of dissemination of the white tip nematode is with the seed. The other two nematodes apparently are not seed borne but are soil borne. It is questionable whether the white tip nematode can be detected on seeds in normal grading procedures, and would require additional laboratory techniques; hence the usefulness of this restriction in the Grade Standard is questionable. Nematodes may be carried in soil particles or other debris included in seed samples. Without specialized laboratory assay, detection would be difficult.

Regermination Requirements

5.1.13 Section 5-3 (Page 42): Except for seeds in environmentally controlled storage, deterioration of germination in a seven-month period could be substantial. It is suggested that the period for which a germination test would be applicable be reduced, perhaps to four months, or such period as experience has shown to be most appropriate. Seeds of certain species, soybeans for example, may need to be germination tested more frequently than other species. U.S. experience is not relevant here. Experience in Tanzania, or in a country with climatic conditions similar to Tanzania, should be considered. Cocperation of TanSeed, the Foundation Seed Farms, and the Seed Testing Laboratory in some simple stor-

age/germination experiments would provide useful information to answer this question.

Clarification of Crop Names and Updating Species Names

5.1.14 Section 21-3 (Pages 50-53): Correction of errors and updating in names of crops and crop species need to be made. The following changes in names are suggested (no change in standards):

1. Cereal Crops:

   Maize (Zea mays)

   Wheat (Triticum aestivum)

   Wheat, durum (Triticum durum)

   Sorghum (Sorghum bicolor)

   Millet, pearl or bulrush (Pennisetum americanum)

   Millet, finger (Eleusine carocana)

   Millet, foxtail (Setaria italica)

   Barley (Hordeum vulgare)

   Rice (Oryza sativa)

   Triticale (Triticosecale spp.) (Same standards as wheat)

2. Grain Legumes and Pulse Crops:

   Cowpeas (Vigna unguiculata)

   Beans, common (Phaselous vulgaris)

   Beans (adzuki Phaselous angularis)

   Beans, hyacinth or bonovist (Dolichos lablab)

   Beans, sword (Canavalia galdiata)

   Pigeonpea, arhar (Cajanus cajan)

   Chickpea (Cicer arietinum)

Field and garden peas (Pisum sativum)

Bambara nut (Voandzeia subterranea)

Greengram, mungbeans (Vigna radiata)

Blackgram (Vigna mungo)

3. Oil Crops:

Soybeans, soya beans (Glycine max)

(no change in other crops)

4. Fiber Crops: (no change)

5. Drug Crops: (no change)

6. Vegetable and Root Crops: (no change)

7. Grasses, Forages, Crops, and Green Manure:

(Pennisetum americanum) (instead of Pennisetum typhoides)

(no other changes)

8. Root Crops and Species:

Potato, Irish (Solanum tuberosum)

Comparable corrections should be made in crop and species names in Tables 1 through 19.

Recommendations for Correcting Deficiencies in Seed, Certification Regulations, and Procedures

5.1.15 The recommendations listed below refer to specific sections and pages of the "Rules, Regulations, and Certification Procedures, Tanzania Official (Seed) Certification Agency" (TOSCA).

Classification of Ambiguous Statements and Deletion of References to Irrelevant Crops

5.1.16 Section V, B-5 (Page 3): It is recommended that the second sentence be deleted. The sentence implies that the breeder is to be the merchandiser.

5.1.17 Section XVII (Pages 2, 4, 9): In no. 7 of the objectives, "corn" should be changed to "maize" (also in Section XXI, B, 1 (Page 11), Section XXIV, B (Page 15).

5.1.18 Section XXI (Pages 10-12): Under A-3, definition of single cross hybrid, delete ".... to be used in production of double, three-way, or top crosses." Single crosses *per se* are increasingly being grown by farmers in many areas of the world.

5.1.19 Section XXII (Page 12): Delete standards for oats as irrelevant and add standards for triticale. The latter may be similar to standards for wheat.

Rules and Regulations Related to Plant Diseases

5.1.20 The comments regarding plant diseases in paragraphs 5.1.09 to 5.1.13 of the Recommended Changes for the "Seeds (Regulations of Standards) Act, 1973" are pertinent here. In addition, attention is directed to the following:

5.1.21 Section XVI (Page 2): The removal of diseased plants should be clarified and restricted only where continued growth of the diseased plant constitutes a threat to the quality of seed produced. Deletion of the last sentence, since spraying to be effective must be timely and if needed

should be done whether or not a production agronomist or field inspector is present to recommend it, is recommended.

5.1.22 Section XVII (Pages 7-9): In view of complaints voiced about certification inspectors requiring removal of diseased plants of inconsequential diseases, the role of the inspector in reporting disease and insect problems and requiring removal of infested plants has been overemphasized. The inspection requirements as set forth in Section XVII do not appear to be as unreasonable as the attempts to enforce them. This points to a lack of understanding by Certification Inspectors as to what diseases are seed borne, to the extent that they affect seed quality, the effect of removal of such diseased plants has on seed quality, and the control that can be effected by seed dressings. For example, it appears unnecessary to visit a wheat field at five-day intervals to record presence of smutted plants, or that all such plants should be removed. When it is recognized that a wheat plant is infected with Ustilago tritici, dissemination of spores has already occurred. It is recommended that this section be revised to correct these problems and concerns. Removal of non-seed borne diseases from the Grade Standards (5.1.09 to 5.1.13) would help clarify the misunderstanding. An educational effort to give the inspectors a clearer understanding of those diseases that are seed borne and those that are not seed borne is urgently needed.

5.1.23 Section XXXVII (Page 22): Diseases as a factor in seed quality needs to be limited to identifiable seed borne diseases.

5.1.24 Section XXII (Page 12): With regard to field and seed standards for loose smut in wheat and barley, see discussions in 5.1.23. Also, delete footnote 3 to Field Standards Table (top of page 13).

Inspection Schedules

5.1.25 Section XVII (Pages 7-9): The requirement of having field inspections of wheat fields each five days for loose smut is unnecessary since the percentage of smutted plants may be determined at any time after flowering and prior to harvest.

5.1.26 With revision of the Seed Act, it would be appropriate to include an inspection schedule for hybrid sorghum. The following is suggested.

Sorghum:

First inspection--prior to flowering

Second inspection--early flowering time

Third inspection--four to six days after first inspection

Fourth inspection--when seed head approaches maturity

Weeds

5.1.27 Section XXII (Page 12): In the field standards for wheat and barley, no "objectional" weeds are permitted in the field. It is not specified which species constitute "objectional" weeds. According to the Seed Act, only those species designated under "Prohibited Noxious Weeds" should be excluded completely from the seed sample, and thusly should be excluded from the field.

5.1.28 Section XVIII (Page 9): Information is not available about the species that should be included in "Prohibited"

and "Restricted Noxious Weeds." It is questionable whether dodder (Cuscuta sp.) should be prohibited from a field of maize or sorghum. It also is questionable whether seed of dodder or witch weed (Stringa sp.) would be present in maize or sorghum seed that has been properly processed. Deletion of the requirements prohibiting certification of fields containing these weeds is recommended. If these weed seeds are found in seed of maize or sorghum, regrading to remove the seeds could be requested, and the seed lot resampled.

Isclation

5.1.29 Section XX (Page 10): Isolation distances for maize appears to be excessive. Isolation distances for maize could be reduced by planting additional pollinator rows around the field. Detailed studies on use of additional pollinator rows have been made at the Iowa Agricultural Experiment Station in the U.S. Wind direction and velocity may need to be considered in making a recommendation.

Field vs. Seed Standards

5.1.30 Section XXII (Page 12): It was found that the field standards are considerably more rigid than the seed standards. For example, in certified seed of wheat, only one plant (head) of other varieties are permitted per 4,000 plants (head). This represents a varietal mixture of 0.025 percent. Yet, 0.5 percent mixture of other varieties, 20 times as much, is permitted in the seed. It is recommended that the standards be examined and adjusted so that the field standards

more nearly reflect seed standards. It also is recommended that the statement "other varieties--doubtful" as in Section XIII, Field Standards for Sorghum, be eliminated.

5.1.31 Sections XXIII, XXV, XXIV (Pages 13-18): In the field standards for sorghum (page 14), rice (page 16), and millet (page 17) plants of other varieties are not permitted in the Foundation Seed class. These standards appear to be unnecessarily rigid, since tolerances are permitted in the seed standards.

Drying

5.1.32 Section XXVII (C) (Page 19): Delay of drying for 24 hours after threshing may permit some heat damage to occur in the humid Tanzania climate. It is recommended that this procedure be reviewed.

Test Weight

5.1.33 Section XXXI (D) (Page 22): "Test Weight" has little effect on seed quality and may be removed as a grade factor.

Crop Names and Species Names

5.1.34 Correction of crop names and updating of species names may be made in accordance with recommendations in paragraph 5.1.15.

Quality Control

5.1.35 No provision is made in the present Seed Certification Rules and Regulations for a quality control program. The following is suggested.

Quality Control

5.1.36 A representative sample of each breeder/foundation/certified seed lot approved for certification, shall be supplied to the breeder/coordinator of each crop, who will grow it in plots at the University of Dar es Salaam, Agricultural College, Morogoro, or on an appropriate Agricultural Research Institute or Foundation Seed Farm. These plots shall be visited jointly by the breeder/coordinator, seed certification field inspection officers, foundation seed farm officials, and TanSeed officials, at an appropriate time so that the distinguishing characteristics of the crop varieties can be identified. The plots from the various seed lots will be examined, studied, and compared for purity, disease, or other factors that may affect certification. Characteristics of the varieties, uniformity among seed lots, and other factors affecting certification may be noted by the inspectors and this information utilized during the course of their inspection visits. In case of a legal dispute, these plots would provide evidence regarding seed enforcement procedures.

APPENDIX SECTION B

ANNEX VI. RECOMMENDATIONS FOR RESEARCH AND DEVELOPMENT FOR CROP PRODUCTION

Agricultural Research in Tanzania

6.1.01 Agricultural research in Tanzania has suffered from its colonial heritage. Although a few productive research stations had been established before independence, senior staff were usually expatriates who concentrated on crop research for the export sector and gave little heed to development of local expertise. This resulted in a dearth of technically trained native people. Since independence, efforts to correct this situation have been started, but progress is understandably slow and reliance on expatriate researchers is still too often the rule. The dissolution of the East African community has hampered cooperative research efforts that had been established among member countries.

Agricultural Research Institutes (ARIs)

6.1.02 The Ministry of Agriculture of Tanzania (KILIMO) maintains 9 agricultural research institutes (ARIs), 23 agricultural experimental sub-stations encompassing crop research activities, and 6 additional ARIs that are concerned with animal research. The ARIs are located in 8 of the 20 regions of Tanzania, with part of the subsidiary experiment stations located in some of the other regions. The ARIs were purposely located in different agri-economic zones. Each has

been given responsibility for certain crop species. The location of each of the ARIs concerned with crops research, the associated experiment stations, and the major crops researched at that station are listed below.

	ARI	Sub-Station	Crops
1.	Lyamungu	Miwaleni	Wheat Coffee (Arabica) Plant Protection
2.	Ilonga	Bihawana Hombolo	Maize, sorghum Millet, legumes
3.	Ifakara		Rice, sugar cane
4.	Ukiriguru	Mwanhala Mwamala Lubaga Mwanga Mabuki	Cotton Root crops
5.	Mlingano	Chambezi Muheza Tanga	Soils Sisal Coconuts
6.	Uyole, Mbeya	Iringa Igeri Mbimba Suluti Mitalula Nienna	Pyrethrum Potatoes
7.	Naliendele	Mtopwa Nachingwea	Oilseeds Cashew nuts
8.	Maruku	Kituntu	Coffee (Robusta)
9.	Tumbi	Chunya Iringa	Tobacco

A map showing the approximate location of the above ARIs is given in Figure 6.1. The professional staff at all locations and their level of training are 65 diplomas, 103 B.S., 11 M.S., and 2 Ph.D.; a total of 181. Reports of the separate ARIs were not made available to the team and only a few of the ARIs

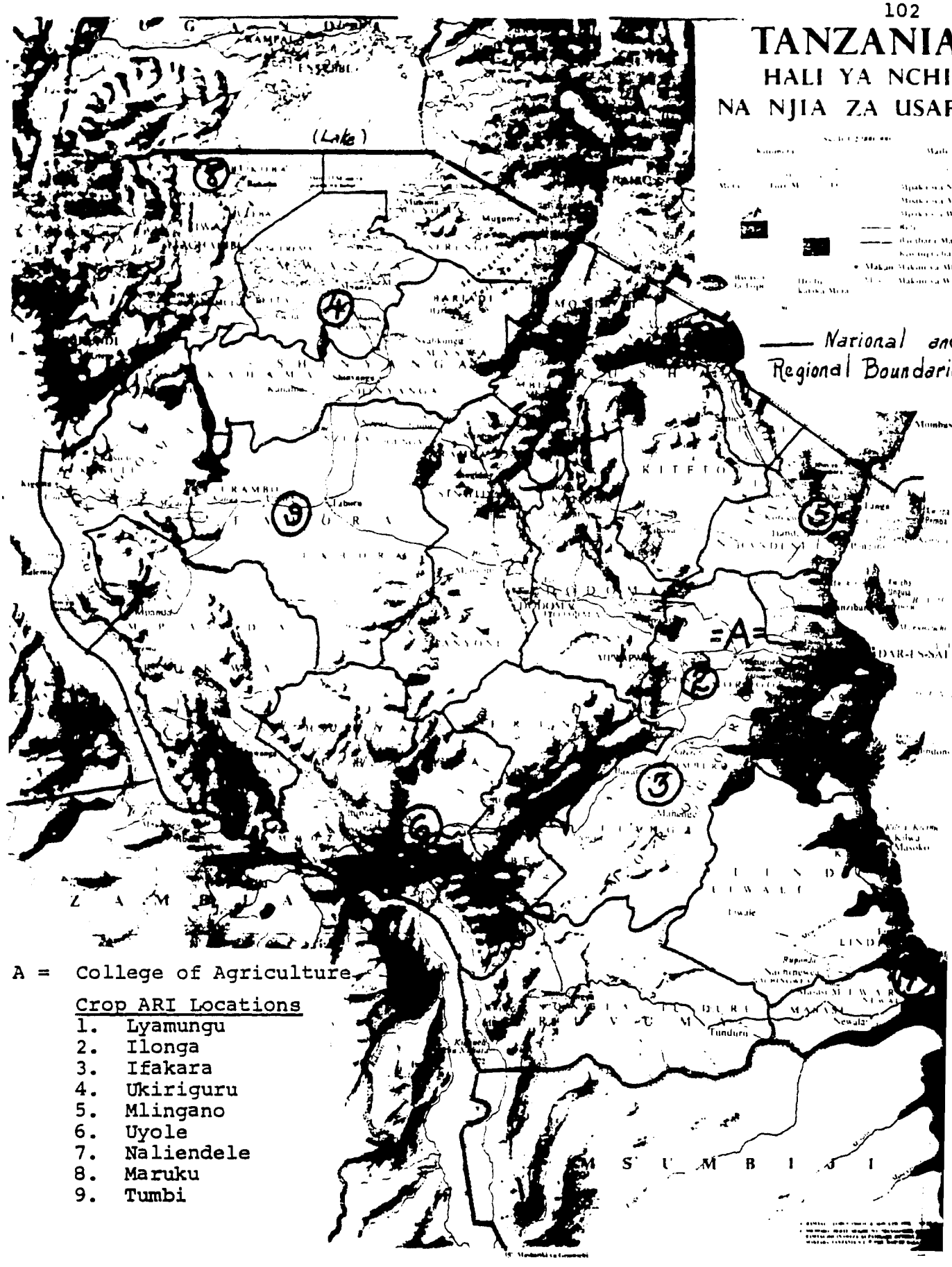

Figure 6.1 Location of Morogoro College of Agriculture and ARIs

were visited due to flooded and impassable roads, the fact that some ARIs are not involved with food crops, shortage of time, and other reasons. It is particularly regrettable that the ARI at Ilonga, with responsbility for several major food grains--maize, sorghum, millet, grain legumes--or the wheat research station, Lyamungu, could not be visited due to impassable roads.

National Crop Research and Planning Committee (NRPC)

6.1.03 Coordination of research among institutes is accomplished through "Specialist Research Coordinating Committees" based on commodities or research disciplines. There are 17 of these committees, with representatives from ARIs, extension, parastatals and regions, which review and formulate research programs annually for approval by a National Crop Research and Planning Committee representing KILIMO. A National Crop Research and Planning meeting was held in Tanga, October 23 to November 3, 1978.

IITA/USAID--Tanzania, Agricultural Research Project 107

6.1.04 This project is conducted by IITA on contract with USAID. The objective is to stimulate production of food crops through technical assistance and participant training. Originally it involved maize and grain legumes. but sorghum/millet and agricultural economics have been added. Some cooperation between IITA and Tanzania in cassava research is also taking place. The project was initiated in 1973,

amended in 1978, and runs to 1980. Expatriate project staffing (midterm 1979 report) included a project manager, maize breeder, maize agronomist, legume breeder, pathologist, legume agronomist, sorghum breeder/agronomist, millet breeder/agronomist, and production economist. The sorghum breeder/agronomist joined only recently, the millet breeder/agronomist position is vacant, and the production economist has not yet arrived. The staff are located at Ilonga, except for the project coordinator who is with KILIMO in Dar es Salaam. Linkages have been established with CIMMYT, who supplies technical staff and support for the maize research, and with ICRISAT, who supplies technical staff and support for the sorghum/millet research. The International Research Centers also provide training programs and organize seminars and workshops. The maize and sorghum breeders serve as the research coordinators for their respective crops on the National Crop Research and Planning Committee.

6.1.05 Another important component of the Agricultural Research Project is training of Tanzanian research staff. The midterm 1978 report indicates that by the end of 1978 there will have been completed 5 B.S. degrees, 1 M.S. degree, and 1 Ph.D. degree, with 4 students working on B.S. degrees, 10 on M.S. degrees, and 1 on a Ph.D. degree. The disciplines were not recorded. In addition 15 students will have received training at an International Research Center.

Other Donor Institutions

6.1.06 In addition to the ARIs and the IITA/USAID project, agricultural research assistance is provided by other agencies and donors. These include such projects as the Canadian-aided Wheat Research Institute at Lyamungu; the Uyole (Nordic) Agricultural Center in Mbeya (a parastatal of KILIMO); the Tropical Pesticides Research Institute (TPRI); the East African Pesticide Control Organization (EAPCO); the Economic Research Bureau (ERB) of the University of Dar es Salaam; the Tea Research Institute of East Africa; the Food and Nutrition Center in the Ministry of Health; the German-aided program at Katrin; British aid in oilseeds; Italian help with oilseeds; FAO national soils projects; and others.

National Scientific Research Council

6.1.07 The National Scientific Research Council was established in 1968 to coordinate all research activities of the Tanzania government. Its purpose is to advise the government on research priorities, allocation of funds according to priorities, and other matters related to implementation of research projects and the training of scientists.

Faculty of Agriculture, Forestry and Veterinary Science, University of Dar es Salaam, Morogoro

6.1.08 The agricultural faculty of the University of Dar es Salaam is located at Morogoro. This is the only institution that offers the B.S. degree in agriculture in Tanzania. It also offers M.S. and occasional Ph.D. degrees. Limited

research is conducted by individual teachers, but it appears to be uncoordinated, often not directed to relevant farm problems, and suffers from inadequate funding. The faculty at Morogoro is under the Ministry of Education and not the Ministry of Agriculture.

Ministry of Agriculture Training Institutes (MATIs)

6.1.09 The Ministry has 10 training institutions generally located in close proximity to ARIs. The MATIs grant a certificate upon completion of 2 years work. They also offer a 2-year diploma program with specialization in one field of agriculture. Research is not conducted at the MATIs and there is a paucity of interchange with the adjacent ARI. Exceptions are Mbeya where informal cooperation has been established, and Tanga where similar activities are being initiated.

Constraints to Agricultural Research and Teaching in Tanzania, as Related to the Seed Industry

Paucity of Resources: Trained Manpower and Funds

6.2.01 Paucity of resources as a constraint is not novel, either to the officials of KILIMO or to the donor institutions. Were it not important, this team would never have been invited to Tanzania. The paucity of trained manpower is documented forcefully in the report to the Arusha Workshop ("The Position of Agricultural Research in Tanzania") which shows only 11 M.S. and 2 Ph.D. graduates in the research

system, supported by 41 expatriate "experts." The report further states that the "system is so thin that it cannot afford to develop specialized skills in the essential disciplines like entomology, pathology, agricultural economics, etc." and cites the shortages in research supporting cadres.

The Isolation of the Faculty of Agriculture, Morogoro, from the Research and Training Institutes and the Extension Service

6.2.02 The Faculty of Agriculture, Morogoro, should be the apex of the agricultural research and teaching system. It is the only institution currently awarding B.S., M.S., and Ph.D. degrees. Instead, it is isolated from the agricultural research and extension programs, administratively responsible to the Ministry of National Education rather than to the Ministry of Agriculture, and has only a weak research component. In this situation it is neither in position to give leadership to the total agricultural research program nor to adequately train M.S. and Ph.D. professionals with the necessary qualifications to fill positions of leadership and resourcefulness in the present research system.

Dispersion of the ARIs

6.2.03 The dispersion of the ARIs--geographically and through commodity orientation--fosters duplication of staff and facilities; hinders interchange of ideas among scientists working on similar problems with different crops; spreads more thinly the meager laboratory and library facilities; and isolates the research worker from his colleagues at Morogoro,

the other ARIs, the MATIs, the field extension workers, and the farmer.

Isolation of ARIs from the Extension Service

6.2.04 Only limited communication exists between the ARIs and the extension field workers. Communication is necessary in both directions. Through the extension worker the researcher learns about the major constraints to crop production, thus being able to keep his research relevant to the farmers' needs. The answers to those problems, when learned, are then communicated back to the farmer through the Extension Service. Without this two-way communication, neither can function efficiently.

Utilization of Expatriates to Conduct Research Rather Than Developing Capacity of Tanzanians to Conduct Research

6.2.05 This question has mixed answers, but it is the team's opinion that expatriates should devote major efforts in developing research capabilities rather than in conducting research. It is recognized that considerable progress is being made in developing capabilities, in some areas, particularly in wheat and maize. It is also recognized that contributions of research to the seed industry, through improved varieties, will, in the short run, be greatest if the expatriates concentrate on research rather than on training. However, this approach simply delays the day when the expatriate can withdraw and leave the research responsibilities

completely to the Tanzanians. Thus, we view this question as a long-term constraint to the ultimate development of a viable seed industry in which adapted varieties will be developed, multiplied, and the seed produced in Tanzania.

Recommendations to Overcome the Constraints in Agricultural Research and Teaching in Tanzania

Paucity of Resources: Trained Manpower and Funds

6.3.01 Competition for students and the high costs of training will necessarily limit the manpower training so that it will not be accomplished quickly. This requires that those trained be utilized to the fullest extent possible. Some provisions should be required to protect the investment in training from being lost. These include:

1. Assigning the trainee to a position in the research area in which he was trained;
2. Rewarding the trainee with salary and benefits commensurate with his position and competitive with positions requiring similar skills in other governmental agencies or parastatals; and
3. Reviewing his regular promotions in his research position so that he will not be seeking other jobs with higher pay.

6.3.02 USAID is now providing training through the Seeds Project and the Agricultural Research Projects. The team noted that the Ford Foundation is financing training of some research people as are the Canadians in their wheat program. The extent to which the German program at Katrin, the British oilseeds program, or the Italian cashew nut program are pro-

viding training in research was not determined. USAID is providing training indirectly through the training centers at IITA, CIMMYT, CIAT, and ICRISAT. As the Title XII U.S. University Programs on Sorghum/Millet and Field Beans develop, they too will be investing in degree training programs at U.S. universities. The limitation will be in finding qualified people.

Isolation of the Faculty of Agriculture, Morogoro

6.3.03 A major step in solving the shortage of research and teaching manpower could be made by upgrading the M.S. and Ph.D. programs at Morogoro. This would reduce the number of students to be sent abroad. In addition, major economies would accrue from this move. For example, central pathology and entomology laboratories could be set up to service all of the ARIs. The seed industry currently suffers from lack of technical assistance in these areas. A central library could be established avoiding much duplication at the different ARIs. The Seed Certification Service and the Central Seed Testing Laboratory are already established at Morogoro. This team is proposing the erection of an environmentally controlled building at Morogoro for central storage of breeder and Foundation seed stocks. The same building could serve the breeder for storage of germ plasm collections. The greatest benefit would be derived from the interchange between the teaching and research workers. This would increase the competence of the teachers, which in turn would be re-

flected in higher quality and better training of the student graduates.

6.3.04 This objective could be accomplished more readily if the Faculty of Agriculture, Forestry, and Fisheries could be placed under the direction of KILIMO. Integration of the research at Morogoro could then be integrated and coordinated with research in the ARIs and expensive duplication of staff and facilities could be avoided.

Dispersion of the ARIs

6.3.05 The handicap to an integrated research program caused by the dispersal of the ARIs is recognized by KILIMO. In the paper presented to the Arusha Conference, "The Position of Agricultural Research in Tanzania," it is stated: "The research system has suffered from the lack of an effective machinery for integration and coordination of activities between institutions as well as between scientists themselves. This situation has, in many cases, led to duplication and/or overlap of programs, malidentification of research priorities and malallocation of scarce resources." KILIMO is already taking some steps to correct this problem. "Specialist Research Coordinating Committees" have been established to achieve integration and coordination of activities. We believe that the greatest coordination would be achieved by having the crop specialist coordinators stationed at Morogoro, with the Faculty of Agriculture, where they could not only coordinate the research on the ARIs but could also be involved in the teaching and training of graduate students.

The seeds project would benefit from this change since specialists from a group of disciplines could be brought together and concentrated on the solution of particular agronomic, genetic, disease, or insect problems related to seed production. Such expertise cannot be duplicated at each research station, and it is not imparted to the students under the present system. With concentration of research activities, it should be possible to eventually reduce the number of ARIs, or their subsidiary experimental stations, and thus divert resources to research that is now spent on maintaining non-productive infrastructure.

Isolation of ARIs from the Extension Service and the Teaching Program (MATIs and the Faculty of Agriculture)

6.3.06 Lack of effective communication between the ARIs and the Extension Service is recognized by KILIMO and steps are being taken to improve the linkages between these institutions. These are documented in "Research/Extension Linkage," a paper presented at the 1979 Arusha Workshop. They are discussed more fully in Chapter VII, Educational and Promotional Programs. The program proposed by KILIMO demonstrates excellent comprehension of the problems. The steps they are proposing to obtain a better information flow from the ARIs to extension and from extension back to the ARI researchers are laudable and deserve the full cooperation of USAID. In the longrun, support of improved ARI research programs and improved ARI/extension linkages can have a greater

effect on the success of the seed program than putting out the fires in order to increase the efficiency of the present program.

6.3.07 One very important element that appears to have been left out of the research/extension linkage is the teaching program. The case for the Faculty of Agriculture, Morogoro, has already been stated. But it is equally important to bring the MATIs into a liaison arrangement with research and extension. It is from the MATIs that the Extension Service obtains most of the extension workers. How can the students who are to become future extension workers be fully informed on current agricultural technology unless their teachers are kept informed of current recommendations? We believe that the MATIs should be represented in the research/extension liaison groups, as proposed in the models presented in Chapter VII. While the extension specialist would be assimilating research findings and passing relevant information onto the extension worker, the MATI representative would be assimilating the relevant research findings and aiding the MATI teachers in keeping their teachings current and relevant. Another reason for keeping the MATI teachers current is that they may then be called upon to conduct short courses, training seminars, or workshops for extension staff, certified seed inspectors, farmers, or other groups.

6.3.08 In order to further integration, we would suggest that research/extension/MATI specialists be stationed at Morogoro so that similar contacts could be made with the

Faculty of Agriculture. This would make the expertise of the faculty available to the specialists and also would bring to the attention of the faculty relevant problems for which research is needed.

Utilization of Expatriates to Conduct Programs Rather Than Training Tanzanians to Conduct Programs

6.3.09 The colonial powers left little behind in Africa in the way of an educational system, and few trained or educated people. USAID should not make this mistake, whether it be a seeds project, a research project, or a country development project. Emphasis on training people to organize and manage and to develop the expertise to make valid judgments should be the major goal of every project. A trained person will make a better contribution to the Tanzania Seed Industry than annual reports and articles published in a research journal. The challenge to the expatriates working in Tanzania is to accomplish both.

APPENDIX SECTION B

ANNEX VII. RECOMMENDATIONS FOR EXTENSION EDUCATIONAL AND PROMOTIONAL PROGRAMS

Situation

7.1.01 In Tanzania, as in most developing countries, responsibility for educating and promoting the use of the improved production practices among villages and individual farmers has been delegated to agricultural extension. It is the general consensus, as revealed by numerous reports and personal conferences with regional staff personnel, that extension has been relatively ineffective in carrying out this assignment--for reasons later described. This situation prevails despite large numbers of village extension workers employed. (Exact numbers cannot be ascertained accurately because of frequent personnel turnover but some reports indicate an authorization of 6,000 to 8,000 positions.)[1/]

7.1.02 The purpose of this extension annex is to give additional descriptive and supportive data for the summary of constraints and recommendations included in Chapter VII. Further discussion of major constraints will precede an explanation of the four structural models for improved extension programs.

[1/] Ibid. Ratchford, p. 41.

Constraints in Extension Efforts

7.1.03 A logical step in the procedure for devising improvements in any program is to evaluate the constraints which hinder achievements of the goals conceptualized. (See Appendix Section A.) Many of the problems, or constraints, affecting the extension program in Tanzania are well summarized and documented in numerous papers and reports. Most crucial to improved extension performance for the seed industry are those related to staff training, stability of tenure, linkage with up-to-date subject matter information, staff supervision, availability of transport, farmer involvement, and demonstration programs. Each of these constraints is considered briefly.

Stability of Tenure

7.1.04 One of the greatest constraints to building a competent, experienced and effective extension staff--at the regional, district, and village levels--is the rapid turnover of personnel. This results in unfilled positions over long time periods and a continuous inflow of new, inexperienced personnel. This hampers good performance. Experience elsewhere shows that tenure of one to two years, sometimes longer, is needed for a local extension worker to gain the confidence of his farmers, to learn about their problems, and to develop the self-confidence needed to be effective. This is hardly possible under prevailing conditions.

7.1.05 The magnitude of the tenure problem may be illustrated with a few examples, drawn from recent staff interviews in two regions. During 1978, over 1/3 of all bwana shambas in Tanga region were lost to other employment, primarily to village manager positions. Last year in Arusha region, 66 village extension workers were lost in similar fashion. Prior to starting the appointment of village managers by TanGov in 1977, the Arusha regional staff included about 260 personnel. Since then about 140 have been shifted to village manager positions--others to national posts, to advanced training institutions, etc.[2/]

7.1.06 In the longrun, these shifts may be useful; agriculturally trained managers may be highly desirable in the predominantly agricultural villages. In the shortrun, the improved seed and other agricultural programs suffer. The new village manager is too burdened with other administrative and managerial duties to aid in conducting method and result demonstrations and monitoring progress, tasks which he might perform as bwana shamba.

7.1.07 The causes of these tenure problems are both general and specific. The general cause stems from the great demand for trained personnel, far in excess of the available supply to support the multitude of development programs and projects. The specific cause relates to the dual nature of administrative direction of regional, district, and village

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[2/]Op. cit. Ratchford, page 42.

personnel. KILIMO is responsible for technical supervision but the PMO has authority for employment and transfers. This dilemma is recognized by both ministries and adjustments are under consideration.

Linkages with Subject Matter Information

7.1.08 Ratchford refers to this constraint as lack of "a close tie with a reliable knowledge base."[3/] Without a close and on-going relationship with researchers and their specialist counterparts, extension workers at all levels are stranded without valid information to extend. Without those vital linkages as explained more fully in Chapter IX, no agricultural extension program can succeed over time.

Staff Training

7.1.09 Lack of initial basic training handicaps the performance of many extension workers--for some at the district level but especially for village-level extension workers (bwana shamba). Some are reported to have only a secondary education. Others have certificate and diploma training at appropriate MATIs--probably adequate basic training under existing conditions since it involves considerable field experience in the training processes.

7.1.10 Probably the greatest training constraint in most regions is the lack of on-going, in-service training--special schools, workshops, seminars, demonstrations, and planning conferences at frequent intervals.

[3/] Op. cit. Ratchford, page 42.

Staff Supervision

7.1.11 A major constraint in developing an awareness and use of high quality improved seed, along with associated inputs and cultural practices, is inadequate training and supervision of village extension workers. This condition results from insufficient staff members at regional and district levels (many are transferred to positions with parastatals, state farms, other institutions, and to village manager roles); from a lack of well-organized and long-range planning; and from a lack of time and transport for frequent contacts with village workers.

Transport Availability

7.1.12 A serious detriment to successful extension work at all levels is the lack of transport. For example, only 3 vehicles currently are available in Arusha region to serve the entire regional staff. RADOs and DADOs, along with members of their staff, often have no way of providing bwana shambas with the field supervision needed for establishing successful applied research and result demonstrations which are essential for encouraging widespread use of improved seed. Bwana shambas, too, lack transport to perform successfully--sometimes (in Arusha region) serving as many as 5 to 10 villages with either no vehicle or only a bicycle for moving from village to village. In some cases, village bwana shambas are bypassed and demonstration projects are worked out with primary and secondary schools. (For example, all 34 field trials for the National Maize Project in Arusha re-

gion in 1979 are being arranged through schools rather than bwana shambas.)

Farmer Involvement

7.1.13 Another constraint to more rapid expansion in the use of improved seed is the general lack of involvement of village farmers as active participants in planning and conducting method and result demonstrations and other educational and promotional activities. The framework exists through village chairmen, their various committees, and the village extension workers; but they need to be challenged and instructed about how to proceed.

7.1.14 Ideally, farmer involvement should be a two-way process--a flow of his most pressing problems through extension channels to the researcher and then a reverse flow of most reliable solutions to the problem back to the farmer.

Demonstration Programs

7.1.15 One effective way to get farmer involvement and one of the most powerful and time-tested methods of educating farmers on the use of improved seeds and associated practices is a well-conducted demonstration. Both method and result demonstrations are valuable, each serving a unique purpose. Method demonstrations show how to apply new technologies in a practical, workable manner; result demonstrations show the consequences of doing so. Both can be closely coordinated field trials associated with applied research.

7.1.16 Some excellent demonstration programs involving improved seeds, fertilizers, and improved cultural practices have been initiated in Tanzania over a period of years. Some have been quite successful. Unfortunately, many have failed for reasons such as outlined above. According to evaluations by RADOs and other extension workers interviewed, the greatest problem has been lack of supervision and "follow through" to get useable data. This, in turn, relates closely to frequent turnover in personnel at the village extension worker level and a lack of transport.

Summary

7.1.17 This ordering of extension constraints is not intended to be exhaustive but does emphasize some which need most urgent attention for enhancing production, distribution, and use of improved seed throughout the country.

Recommendations: Proposed Models for Improved Extension Programs

7.1.18 A simple answer to questions of improving the extension program in general, and for the improved seed program in particular, is to recommend that changes be made to overcome the major constraints as outlined above. The solution is not so simplistic.

7.1.19 The major premise of these recommendations is that a successful extension program over time--in any region, district, or village--can be achieved only through a carefully planned, organized, and integrated national program which is

implemented step-by-step over a period of years. The logic and a proposed step-wise procedure for planning, implementing, evaluating, and adjusting such a program are outlined in Appendix A of this report.

7.1.20 Survey team no. 1 proposed that a model extension program to serve the seed industry be designed for the Arusha region as a pilot-study pattern for possible expansion to other regions over time. Some deviations from this procedure seemed in order.

7.1.21 First of all, it seemed unwise to consider a separate extension program for the seed industry. Team no. 1 concurs with this conclusion. Since the Tanzanian extension program is organized, structurally, with national direction through KILIMO and 20 regional units, all local extension efforts in connection with the seed industry, logically, should be integrated within the national structure and on-going programs.

7.1.22 Achieving this coordination and integration to serve the seed industry is not a simple task. To do so requires some consideration of the structure and functioning of the overall extension program and of region-specific models for accomplishing the integration essential for a viable program. These will be treated in order.

The National Extension Program

7.1.23 It is beyond the scope of this assignment to evaluate and suggest detailed modifications in the overall exten-

sion program in Tanzania. However, because of inter-relationships with regional programs and of the need for integrating improved seed programs with other extension activities, it cannot be ignored completely. Perhaps a few brief observations are appropriate.

7.1.24 One useful concept for the overall extension was developed by Dr. McDermott. He suggests two major segments of a nation-wide extension program--"center extension" and "field extension."[4/]

7.1.25 The center extension would be centered in KILIMO and would be directed by a top administrator/coordinator. Over time, his staff might include other more specialized officers who would serve special functions--preparing visual aids, leaflets, folders, etc. and arranging special training schools, seminars, conferences, and short courses. Their primary function, however, would be to serve in a liaison capacity to assure closer integration of research, extension, and service organizations and of related functions as later indicated. This central direction and coordination seems essential for an effective and expanding program. The primary function would be to support, strengthen, and coordinate the separate regional extension programs.

7.1.26 Field extension would be regionally centered in accord with national development policy. Extension programs and activities would be administered through the RADO in each region. He would channel information to each of the DADOs

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[4/] Ibid. McDermott, page 1.

under his jurisdiction and they in turn would extend it to the village extension workers (bwana shambas) within their respective districts. This operational system will be elaborated later.

7.1.27 As perceived by the Missouri team, four modifications could be made to make the existing extension system far more effective--for the improved seed project and for the overall extension program as well.

1. Provide closer liaison and integration among the various entities essential for an on-going, vibrant extension program--including KILIMO, the College of Agriculture at Morogoro, the ARIs, the MATIs, the donor research and development programs, and the regional agricultural staff from the RADO down through the district, ward, and village levels.

2. Arrange for "subject matter specialists" to work with the RADO at the regional level and, eventually, with the staff of each DADO within the region. Functions of specialists and relationships among them will be suggested later.

3. Develop over time a more problem-oriented and systems approach in all extension activities, extending through all channels from the individual farmer to the researcher.

4. Organize Extension/Research Liaison Committees at the national, regional, and district levels to help assure better integrated program planning and monitoring, with all segments and interests represented.

7.1.28 After conceptualizing the above modifications, a conference with KILIMO officials revealed that plans already are under way for revisions in the national extension program which are very much in accord with team recommendations. Details of the revised plan were explained by Mr. S. Khamisi, Principal Agricultural Secretary of the Ministry and Acting Director of the Crop Development Division, and by Mr. Mtenga, Senior Agricultural Officer. Mr. Khamisi served as a discus-

sant for the Extension Committee during the Tanzania Agricultural Research Workshop in Arusha February 26 to March 3, 1979. Mr. Mtenga has assumed responsibility for drafting plans for the new "extension vitalization program." These plans are nearing completion.[5/]

7.1.29 Key features of the revised plan can be explained from both a structural and a functional point of view. The structural format is illustrated in Figure 7.1.

7.1.30 Functional and operational responsibilities and relationships may be explained briefly as follows:

1. THE KILIMO CHIEF ADMINISTRATIVE OFFICER (title uncertain) would be responsible for coordinating and integrating the programs and activities of different branches of the overall system. His office would support the regional extension organizations in numerous ways as earlier mentioned.

2. THE EXTENSION LIAISON OFFICER would be the connecting link between the researcher and the farmer, operating through the RADO, the DADOs, and the village extension workers and any subject matter specialists on their staffs. His responsibilities would include work with researchers to adapt their findings for field application, to train and assist the above staff members, and to transmit problems of farmers and extension workers back to researchers. This should help researchers keep their efforts more closely aligned with the problems and needs of the area.

   The plan provides for one Liaison Officer to be assigned to each ARI. The team wishes to suggest stationing an additional one at Morogoro College. Each Liaison Officer is expected to have training at either the M.S. or Ph.D. level.

[5/] The framework for this revised extension program is explained in an appendix to the paper presented by M. P. Collinson, Research/Extension Linkage, the Arusha Research Workshop, February 26 to March 3, 1979--Appendix I.

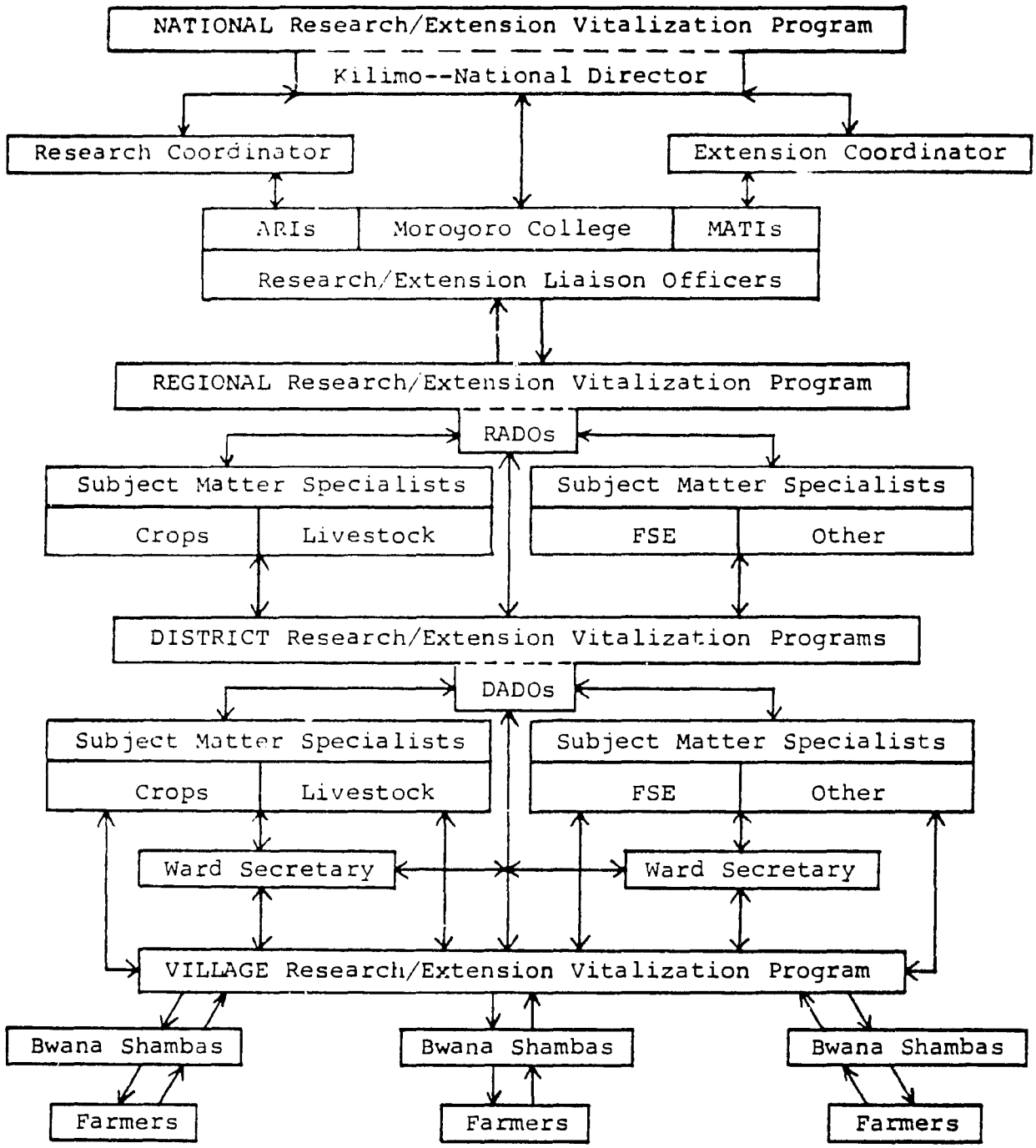

Figure 7.1 Structural Model for Tanzanian National Research/ Extension Vitalization Program (Constructed from Interview Notes with Mr. Khamisi and Mr. Mtenga-- April, 1979)

3. THE REGIONAL SUBJECT MATTER SPECIALISTS would devote full time to adapting research findings to the needs of the area; to assisting DADOs and bwana shambas in conducting field trials, method and result demonstrations, meetings, field days, etc.; and to establishing on-going training for other extension workers through special schools, short courses, seminars, and on-the-job supervision and assistance. Special training schools for farmers may be included.

   The number and kind of specialists would vary with the needs of the region but, for most regions, the staff might include an agronomist, a livestock specialist, and perhaps an FSE (Farming Systems Economist) as proposed in one paper at the Arusha Conference.[6] The FSE would work with other specialists, field extension workers, and farmers to assist in conducting diagnostic surveys for research problem identification; in integrating experimental results and their economic impact; in monitoring the adoption of improved practices and their economic consequences; and with other duties suggested by Mr. Collinson.[7] Regional specialists would be under the supervision of the RADO and would need minimum training of a B.S. degree, with an M.S. degree preferred.

4. THE DISTRICT SUBJECT MATTER SPECIALISTS would function at the district level much as outlined above for similar specialists at the regional level. Minimum training for these specialists would be diplomas from appropriate MATIs, with a B.S. degree preferred.

5. THE VILLAGE EXTENSION WORKERS would provide the field link with individual farmers, village chairmen and committees, school officials, and ward officers. In connection with the seed industry, they would be responsible for on-going field trials and demonstrations, along with associated meetings, field days, slide shows, and related activities. Minimum training should be at either the certificate or diploma level.

[6] Ibid. Collinson, Appendix II (a).

[7] Ibid. Collinson, Appendix II (a).

Regional Extension Programs (Structural and Functional Models)

7.1.31 Team no. 1 suggested that the present team develop a model extension program for one region, preferably Arusha, as a pilot demonstration for special study and possible expansion to other regions over time. After arrival in Tanzania, three such pilot-study models were found to be in progress: one in the Mbeya area sponsored by the Nordic group; one in the Tanga region in connection with the German-sponsored "Tanga Integrated Rural Development Program" (TIRDEP); and a third in the Mtwara/Lindi area supported by British personnel and services. The latter is reported to be in initial planning stages and no attempt was made for a personal visit. Each of the other projects was visited and studied in depth with Tanzanian and expatriate officials involved. Highlights of the observations and evaluations are summarized below.

7.1.32 The Uyole Agricultural Center Model (Mbeya Area): One team member visited this project when in the early planning stages in 1973. It seemed to offer great promise for a viable extension program.

7.1.33 A revisit with the Uyole Research and Training Center staff in early April of this year revealed excellent progress in developing the special area project, both in structural and functional aspects.

7.1.34 Unique features of the Uyole structural system are illustrated in Figure 7.2. A few explanatory comments may

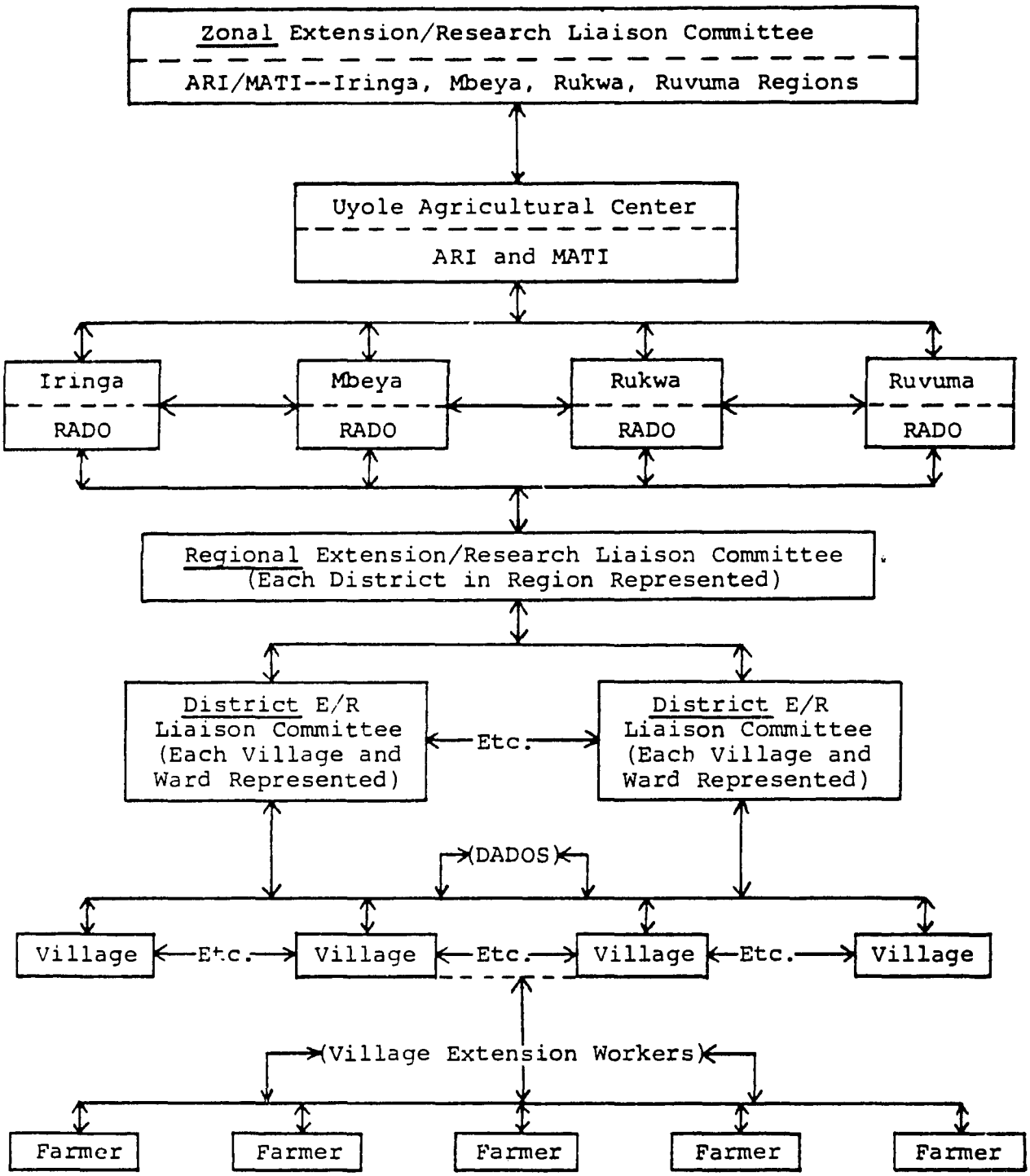

Figure 7.2 Mbeya Area Extension/Research Model--Two-Way Flow of Information: Zonal Liaison Committee to Farmer/ Farmer to Zonal Committee (Constructed from Interview Notes, April, 1979)

clarify some of the unique features and interrelationships. First of all, the program embraces four regions rather than one--Mbeya, Iringa, Rukwa, and Ruvuma. As indicated, a Zonal Extension/Research Liaison Committee with representation from all four regions is responsible for overall planning and integration of zonal programs, projects, and activities. The committee includes RADOs and DADOs from each region and representatives from the Uyole ARI, the MATI, and from LIDA. A similar Liaison Committee functions within each region.

7.1.35 Functionally, the Uyole program operates much as described earlier for the "National Extension Vitalization Program." Worthy of special attention, however, is the prominence given to group training efforts. The MATI under Mr. Kimiti, principal, conducts different kinds of special short courses and training schools in addition to certificate and diploma training. For example, 3-month training courses have been conducted in agricultural mechanization and production of sunflower, a new crop in the area. Mr. Kimiti indicated a willingness to initiate intensive short course training for extension workers, such as refresher courses for experienced ones and orientation courses for new employees.

7.1.36 Another unique activity is the conduct of regional 3-day seminars within the zone, such as one in progress in early April in Songea. At each seminar, the RADO, DADO, and a substantial number of bwana shambas attend (financing is not available for all to attend seminars). The RDD and RDO also are invited and some attend. The main purpose of semi-

nars is to present current research findings and to get first-hand reports of problems from field workers. Researchers from all departments of the Uyole Institute participate in all the regional seminars.

7.1.37 Periodically, special field days are held at the Institute for RADOs, DADOs, village officials, and farmers to show and explain research currently in progress.

7.1.38 The Tanga Model (TIRDEP): The German-assisted rural development program was initiated in 1972 but regionalization and other interruptions delayed funding until 1977.

7.1.39 The extension model is only one segment of the comprehensive rural development within TIRDEP. The structure for the model program is illustrated in Figure 7.3. In principle, it is quite similar to the Uyole model but contains a few variations as noted.

7.1.40 Functional operations of the program likewise are similar to those at Uyole, with emphasis upon training and demonstrations. In addition the program is designed to provide supportive facilities and equipment. For example, during 1978 the project provided 21 motor vehicles, 170 bicycles for field staff, 120 hand sprayers, 60 spring balances, photo equipment, input packets for field demonstrations, and other items.

7.1.41 The Arusha Model: Extensive personal conferences with members of the RADO staff in Arusha revealed constraints similar to those earlier outlined. One of the most disruptive to carrying out field demonstrations and other programs

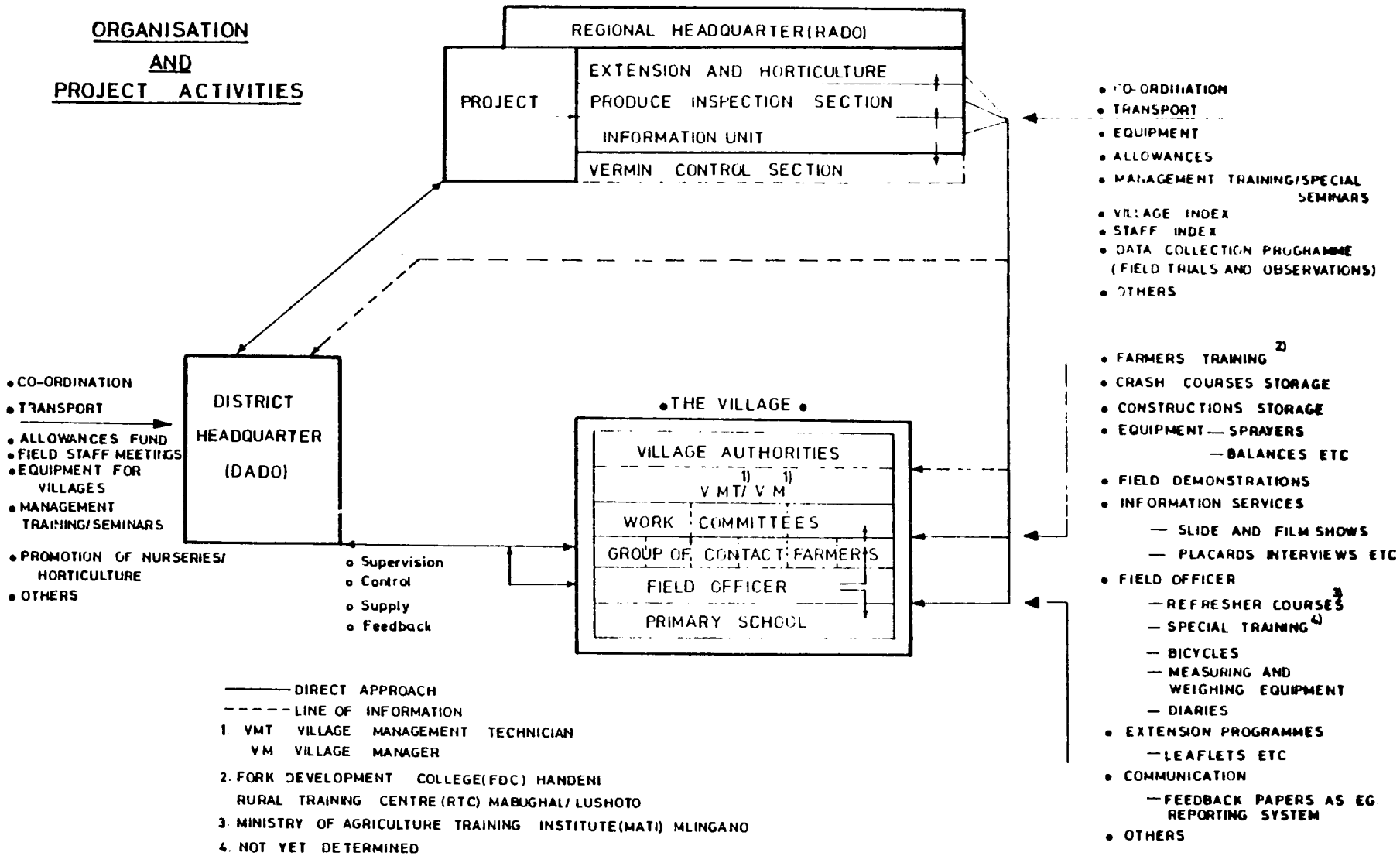

Figure 7.3 Model of Agricultural Extension Project (TIRDEP)/Regional Agricultural Development Office, Tanga Region

is the frequent transfer of bwana shambas to other positions. For example, during 1978, 66 of them were transferred to village manager positions alone. Few of the bwana shambas are located in one village long enough to get acquainted, to gain the confidence of village officials and farmers, and to take advantage of any training provided. As one consequence, all 34 of the 1979 national maize field trials in the Arusha region are being established with school officials rather than village extension workers.

7.1.42 Designing a special model for an improved extension program in Arusha region involved selection of special features of the 3 models earlier presented. A model patterned after the "National Extension Vitalization Program," along with some features of the other models, resulted in a model which seems appropriate for Arusha region and the six districts involved. A structural model of the proposal is illustrated in Figure 7.4. Functional aspects would be similar to those already described.

7.1.43 The Arusha regional staff members were very cooperative and seemed competent and willing to develop an improved extension program in all districts. They are quite frustrated in their efforts, however, because of little stability of tenure, almost no transport equipment at all levels, and other problems which seem to hamper all activities.

7.1.44 A summary of major constraints is included in Chapter VII.

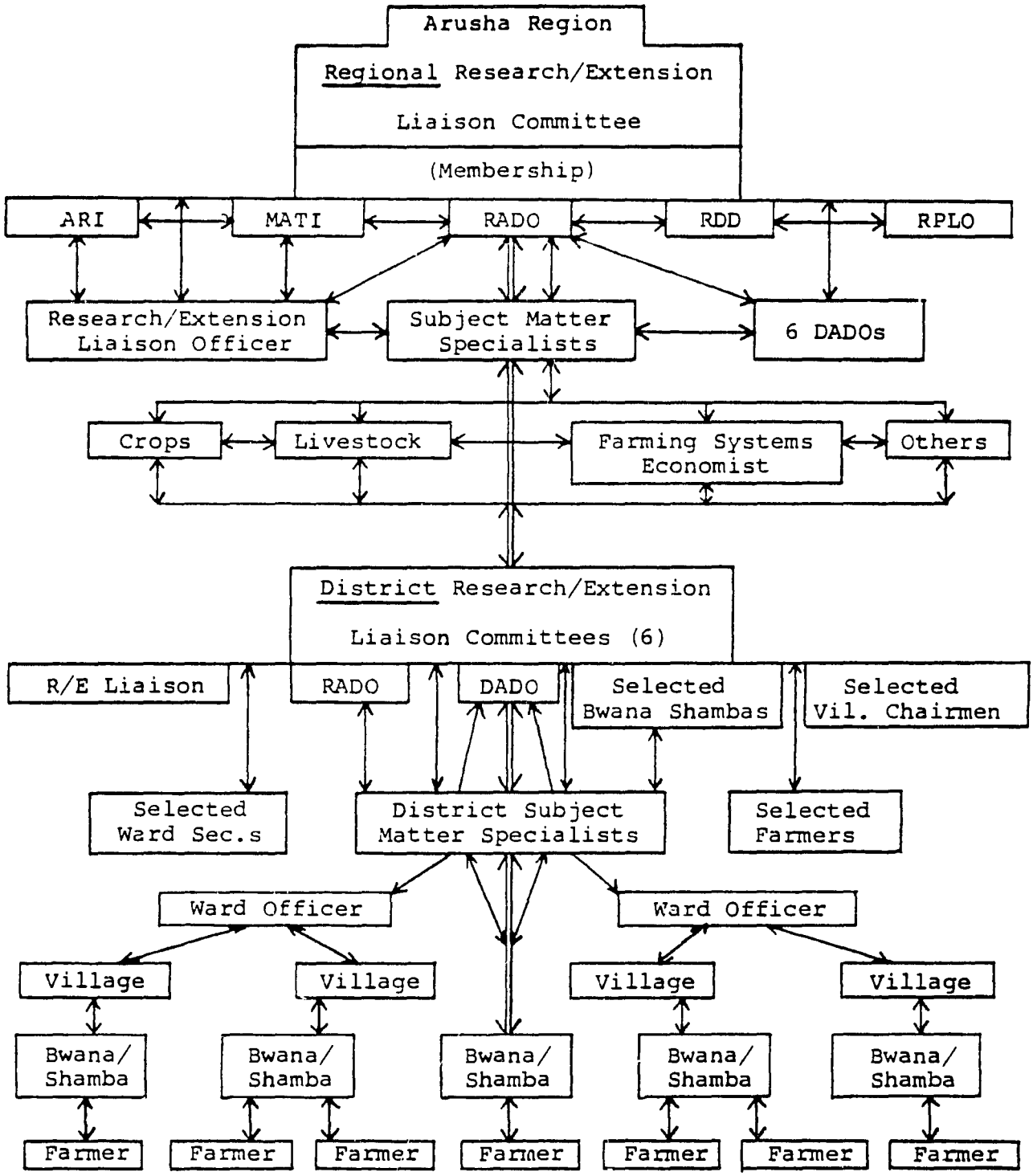

Figure 7.4 Proposed Extension Model for Arusha Region--Featuring Research/Extension Liaison Committees, R/E Liaison Officer, and Subject Matter Specialists

APPENDIX SECTION B

ANNEX VIII. SEED MARKETING AND DISTRIBUTION

Introduction

Inclusions

8.01 The marketing and distribution system includes all non-production aspects of the system by which seed is taken from the breeder and placed in the hands of the farmer. Marketing and distribution also includes storage, transportation, advertising, pricing, selling, and financing. In addition, it involves the market intelligence needed to ascertain new production needs and to provide for appropriate time and spatial distribution of existing supplies.

Exclusions

8.02 The marketing and distribution system as discussed here does not include the distribution system for production supplies and machinery. The timely availability of such supplies and machinery, although important to the performance of the seed industry, is more appropriately addressed elsewhere in connection with production considerations.

Situation

Heterogeneity

8.03 The distribution and marketing system in Tanzania may be viewed as not one system, but several. Governmental

decentralization has contributed to this. The actions of government with respect to the seed industry vary by region. The dominant agricultural crops vary by region, as do also transportation, educational, and financial facilities.

Seed Sources

8.04 As might be expected, the vast majority of seed used comes from traditional peasant saving of past production. Certainly the planting of certified or even "less improved" seed is not yet the norm.

8.05 Some of the regions have or are planning what they call seed farms. Complete data on these were not available but several things seem clear:

1. Seeds so produced at present are of uncertain origin and may not meet certified seed standards;
2. Regional governments which have financed regional seed farms likely have reduced incentive to develop support for certified seed use within the region; and
3. Market intelligence gathering is made more difficult for TanSeed.

8.06 Certified seed is available only from TanSeed which has in turn secured it from certified seed growers with whom it has contracted to make the final multiplication to produce certified seed. Data are questionable but informed estimates would put TanSeed certified seed at from one-tenth to one-sixth of the food grain seed used in Tanzania.

Patterns of Seed Distribution

8.07 One pattern is the use of locally grown unimproved seed. This involves the traditional channels. Seed is not

transported far, if at all. Institutionalized credit is not utilized. The market is primitive in a technical sense only. It works and it gets seed of sorts to the farmer as it has for centuries. Although this is the largest segment of the seed distribution system it is not the portion to which greatest attention is given, for this system does not carry improved seeds.

8.08 As already indicated, it was not possible to assess the precise present or future importance of seed produced under a scheme developed by regional governments. Most likely the seeds would be promoted as a portion of a regional program and that regional program could include the promotion of improved inputs such as pesticides and fertilizers. Subsidy might be involved. Credit might be possible but it is unlikely that regional governments would so use their limited resources. Credit, if institutionalized through TRDB, is most likely to push certified seed as opposed to regional seed.

8.09 The distribution pattern for certified seed is given primary consideration by the survey team. This pattern comes in two versions. One involves credit by TRDB. The other is straight commercial sale by TanSeed.

8.10 Certified Seed With Credit. TRDB has as its mission the extension of credit on a sound financial basis. TRDB does not make loans which it anticipates being unable to recover. The result is that credit is not available to everyone. In addition TRDB does not operate in all regions.

Where TRDB does operate it usually extends credit not on an individual basis but to a primary cooperative society which is usually an ujamaa village. The village then in effect subcontracts the loans and any default of those receiving credit becomes an obligation of the village. Thus there is local incentive to see that individuals who receive credit do not default.

8.11 Credit extended by TRDB for seed is in kind. Indeed it is for an input package which includes seed, pesticides, and fertilizer. TRDB secures the inputs from the appropriate suppliers, including TanSeed, and moves them to the village level. Where TRDB takes possession of the certified seed will depend on the depth of the regional distribution system maintained by TanSeed. They are not uniform throughout Tanzania.

8.12 Certified Seed Without Credit. Since the majority of Tanzanian agriculture is subsistence agriculture, the movement of certified seed without credit is very limited although there is evidence that this situation can change. When subsistence farmers have had positive experience with certified seed the lack of credit is less a problem than some might believe. Effective demand for certified seed, even without credit, does increase when the farmers understand the importance of good seed. Obviously, it is likely to be greater when those who cannot engage in self-financing have access to credit.

8.13 The need for credit is likely to be related to the stage of agricultural development. Where holdings are large

the wealth position of farmers allows more self-financing. Thus certified seed sales for cash or at least without TRDB financing are concentrated in those areas of the northern and southern highlands where larger scale and more highly advanced agriculture has developed. This is an important portion of TanSeed business but it is not that portion with which the United States and TanGov have the greatest social concern. The reasons are clear. This portion of the agricultural sector does not include the majority of the people.

TanSeed Operations

8.14 TanSeed is a parastatal with 62 percent ownership by TanGov through a chain which reaches through KILIMO to NAFCO to TanSeed. The remaining 38 percent is owned by CDC. TanSeed originated as an offshoot of TanWatt. The mission of TanSeed is to receive foundation seed, secure its increase to certified seed, and then provide the improved seed to Tanzanian farmers. All this it is supposed to do at a profit and, indeed, TanSeed has managed to gain revenues in excess of costs. But TanSeed is a developing parastatal and it has not yet developed so that it can serve all the country in all seeds needed.

8.15 TanSeed secures its foundation seed from the KILIMO Foundation Seed Farms and in the case of maize also from TanWatt. This is taken at a price and in quantities negotiated between buyer and seller. This seed is then turned over to contract growers who expand the seed to certified seed. The contract growers include the KILIMO Foundation Seed Farms,

for as of now they have land in excess of that used for the growing of foundation seed. To minimize its transport costs, TanSeed prefers to have its contract growers as near as possible to where the certified seed will be used. Obviously also a consideration is the location of TanSeed branches, for it is only there that TanSeed has seed processing facilities.

8.16 TanSeed does not multiply seeds for which there is other major parastatal authority. Thus cotton, tobacco, and pyrethrum are not a concern of TanSeed. The major emphasis is on food crops. In addition to those food crops for which there are seed certification programs, TanSeed also attempts to make available improved seeds for vegetables and pulses. Sometimes these seeds are imported but more often TanSeed secures an improved line which it calls "parental seed" and gives this to contract growers for final multiplication before the seed is marketed.

8.17 TanSeed has its headquarters in Arusha. It also maintains branch offices at Arusha, Morogoro, and Njombe. Branches are defined as outposts which have both storage and processing facilities. See Figure 3.1.

8.18 TanSeed also maintains a network of depots. Depots have seed storage only. Presently a depot is operating at Mwanza and new ones are expected to open in 1979 in Tabora, Dodoma, and Mbeya. TanSeed also is considering additional depots at Iringa and Lindi. Still further into the future is the possibility of depots at Tanga and Songea.

8.19 TanSeed takes possession of harvested certified seed at the field of the contract grower and moves it to

processing facilities and on to depots. This is accomplished with hired lorries, for TanSeed does not maintain its own fleet. Because TanSeed pays this transport cost, the company has incentive to strive for a spatial distribution of activities which will minimize this cost. Some distribution is made by rail.

8.20 Since TanSeed does not have a fleet of lorries, it hires other persons or agencies to move seed from the depots. Most often this is to the regional government and/or TRDB.

8.21 The pricing of seed by TanSeed has three aspects--the pricing of foundation seed, the buying price for certified seed, and the selling price of certified seed. The buying price for foundation seed is based on the foundation seed farms' costs with the expected results that the foundation farms want more and TanSeed feels the foundation farms' costs are excessive.

8.22 The growing of certified seed is more costly than the growing of market grain or other market commodities. Thus TanSeed must pay its contract growers considerably more than the market price for the final consumable product. As would be expected, the relative premium for maize exceeds that for more easily produced wheat.

8.23 TanSeed prices its certified seed to cover all its costs and adds an appropriate increment for profit. This system includes constraints however. Even in an administered pricing system, TanSeed must price so that it can sell the volume of seed it has produced. Otherwise either TanSeed

must carry over seed at considerable cost or dispose of the seed as common grain. Sometimes, the alternative of selling surplus stocks as common grain is not an option because of seed treatments which render the grain inedible for either human or animal use.

8.24 Advertising of TanSeed offerings is performed by the distribution of flyers in both English and Swahili and by limited newspaper advertising. Informational and promotional advertising is by necessity modest in the Tanzanian setting. The most important advertising is done through result demonstrations which are limited in number. TanSeed does support such demonstrations with the provision of free seed. The seed bags carry seed quality information and the company logo which is a maize ear. To the illiterate, this may be confusing since the maize logo also appears on seed sacks which do not contain maize.

8.25 Market intelligence is an important function of TanSeed but because government is also involved in this it is discussed in a separate section.

Market Intelligence

8.26 Market intelligence derives from several sources. Regional governments make estimates of anticipated seed needs. These estimates are relayed to TanSeed. The level of sophistication of the estimating process cannot be generalized. This system of shared responsibility of regional officials and TanSeed does work, but it would be greatly improved by more adequate staffing in regional government and by increased

certainty and tenure in assignment. Only personnel who work with a system over an extended time can be expected to produce estimates of need which are tolerably close to the real need. Otherwise, for profit reasons, a tendency will prevail to estimate needs so as to minimize carryover stocks. The problem of regional overestimation of seed needs over time will continue until effective means of communicating to the farmer the benefits of certified seed are devised. But whatever the inadequacies of market intelligence gathering, these do not appear at this time to be major constraints to the further development of the seed industry.

8.27 Development projects often have a seed need component and these estimates of increased seed use provide additional data.

8.28 Finally, TanSeed makes its final estimates. In doing this, it utilizes its own record of experience and government estimates. Often this involves a discounting of government estimates since experience shows that a simple summation of regional estimates would be misleading.

Quality Control

8.29 Quality control is important in both the production and the marketing processes. Attempts of quality control are made and, in principle at least, the mechanisms exist to maintain quality. Assuming that the foundation seed farms provide good seed to TanSeed the processes of control are as follows:

8.30 TanSeed representatives provide proper seeds to contract growers. During the growing season, both formal and inspection visits are made by field representatives of TanSeed. TanSeed contracts with growers provide for such inspections. These inspections follow, generally, the provisions of the seed certification law.

8.31 TOSCA is charged with making appropriate and official field inspections to assure quality certified seed. Personnel and transport performing this task are extremely limited and thus the adequacy of performance is in doubt.

8.32 After processing of certified seed by TanSeed, samples are sent to the national seed laboratory at Morogoro or to the branch at Arusha. If these tests qualify the seed as certified seed the results of the test are put on the seed bag and the seed is packaged for sale. The tests are legally valid for eight months. After that, retesting is required.

Constraints

8.33 Tanzania has made progress in providing improved seed. A marketing and distribution system is in place--imperfect, but there. But further development of the system is appropriate and important constraints hinder development. These constraints are in the following areas:

1. Trained manpower;
2. Transport;
3. Coordination; and
4. Roads and storage.

8.34 Trained Manpower. Manpower is inadequate in numbers and training at the foundation seed farm level which

serves the marketing system. Manpower is also inadequate in training and numbers needed to perform the necessary field inspections, processing and seed testing. Manpower also is inadequate to provide the information flow from researcher to farmer that will develop the demand for improved seeds.

8.35 Transport. Trained personnel already available for field inspection, and educational and planning work to stimulate demand for improved seed, often fail to perform their work expeditiously or at all because of the lack of transport to take them to the places they need to be at the times they need to be there.

8.36 Coordination. Close coordination between regional governments and TanSeed is seriously hampered not only by lack of personnel but by the uncertain tenure of those who hold various regional positions. Short tenure and/or transfer in the middle of projects makes it difficult to make plans and implement them. Poor performance, even by well trained people, results when personnel are moved too soon and at inappropriate times. Such transfers hamper the development of the knowledge, skills, and trust relationships necessary to insure that the seed industry contributes its potential to Tanzanian agricultural development.

8.37 Coordination between regional authorities and TanSeed in the development of regional seed multiplication farms is inadequate. Uncoordinated regional seed farm development seriously inhibits market intelligence activities by TanSeed and could easily result in regional authorities promoting re-

gional seed at the expense of superior certified seed. If the process is coordinated, the regional efforts can enhance the national effort to provide a truly effective improved seed distribution network.

8.38 Roads and Storage. TanSeed is seriously hampered in efforts to move seed conveniently close to farmers. Often roads are inadequate for lorries to move seed to within one day's carry of each village. TanSeed is also hampered by the dearth of small scale but adequate seed storage facilities maintained by either regional authorities or TanSeed at locations more accessible to farmers than the current TanSeed branches and depots. As a result the "real" availability of improved seeds is restricted, for there will be limited demand where there are no supplies readily and easily available. Up to a point, Say's Law holds. Supply does create its own demand.

Recommendations

8.39 Several actions are appropriate for reducing or eliminating the important constraints already identified.

Trained Manpower

8.40 For the relaxing of the trained manpower constraint the following actions are proposed:

8.41 Recommendation 1. At each of the foundation seed farms it should be policy and practice to always have an assistant manager and an assistant mechanic in training on the job. Appropriate pre-farm assignment training should, of

course, be also provided. Such a policy would give the depth of skills necessary to keep good foundation seed flowing to TanSeed. If this is not provided, the smooth flow of foundation seed may be interrupted. More help is needed. A person must be available to take over immediately in the case of illness, accident, death, or transfer.

8.42 Recommendation 2. More and better trained field inspectors should be provided. A three-fold increase is appropriate.

8.43 Recommendation 3. More seed laboratory people should be trained so that seed testing can be done more often and so that samples can be grown out in coordination with field inspection training. This need is covered elsewhere in more detail.

8.44 Recommendation 4. The system for information flow from researcher to farmer should be drastically improved. Detailed suggestions for accomplishing this are included elsewhere but the program should provide for result demonstrations to educate farmers on the merits of improved seeds.

Transport

8.45 For relaxing the transport constraint, it is essential that adequate transport be provided for performing required field inspections. Adequate transport for extension workers also is essential to allow developing and carrying to completion result demonstrations to show the value of improved practices, including seed.

8.46 Recommendation 1. Provide adequate transport to field inspectors. Four-wheel drive vehicles are essential for inspectors. One for each field inspector is required. If this transport is not provided, quality control will continue to be poor and farmers will be given seed which does not meet standards. It is exceedingly difficult to get a farmer to use improved seed when, in his own experience, he has used the seed and found it not "improved" as promised.

8.47 Recommendation 2. Provide adequate transport to regional and district agricultural (including extension) personnel, as suggested in Chapter VII.

Coordination

8.48 For relaxing the coordination constraint the following actions are proposed:

8.49 Recommendation 1. Tenure in positions should be lengthened and assured so that personnel have time to organize and carry out their assignments. Effectively, this means strengthening KILIMO personnel authority as opposed to PMO personnel authority. Unless such policy change is made and honored by the host government, little improvement will take place. Personnel once assigned must be allowed to plan and carry out projects, often involving biological time requirements. This is a necessary condition for improving the performance of the seed industry complex.

8.50 Recommendation 2. The development of regional seed farms should take place only as a result of joint planning by regional authorities and TanSeed. The ultimate aim

of regional seed multiplication farms should be for them to serve as contract growers of certified seed for TanSeed. If this is not done, the regions will end up working at cross purposes with the national effort to provide an improved seed system which can serve the entire nation. The effectiveness of donor resources put into seed programs will be diminished substantially. This is a "luxury" Tanzania cannot afford.

Roads and Storage

8.51 For the relaxing of this constraint, the following actions are proposed:

8.52 Recommendation 1. Assist the TanSeed distribution network by continuing to assist in the development of improved roads. No specifics are offered here as this is intended as an indication of appropriate direction.

8.53 Recommendation 2. Assist TanSeed and/or regional authorities in designing and constructing appropriate small scale seed storage facilities which will allow the timely placing of seed closer to the farmer who will use the seed. Steps in this direction are already being taken. A 29 March 1979 article in Daily News reports plans to construct 137 go-downs in Iringa region with USAID and IDA funding.

APPENDIX SECTION C

I. KIBAHA FOUNDATION SEED FARM

Crop Production Cost Analysis*

The fertilizer rates in this report follow the recommendations in the soil survey report done by Mr. John Swenson.

Production costs are based on a 1979 estimated cost schedule published by Iowa State University. I believe that the higher fuel and repair parts cost here in Tanzania will balance out the higher labor cost in the U.S.A.

Yearly production costs for maize and sorghum:

Lime:
2270 kilograms per hectare.....2205/
Nitrogen:
123 kilograms per hectare..... 625/
Phosphorus:
123 kilograms per hectare..... 411/
Potash:
100 kilograms per hectare..... 254/
Total Fertilizer Cost..... 3493/

Machinery Cost:
This includes disking, planting, fertilizer spreading, spraying, cultivating, harvesting, hauling, and shelling
Total Machinery Cost..... 1225/

Chemicals:
Two litres of insecticide per hectare..... 120/
Two litres of herbicide per hectare..... 120/
Total Chemical Cost..... 240/

Miscellaneous Costs:
Includes hand weeding, roguing, and guard service against birds and wild animals
Total Miscellaneous Cost..... 122/

Total Production Cost..... 5080/

Estimated Yields and Revenues:
Maize:
5 tons per hectare at 1/85¢ per kilogram..... 9250/
Sorghum:
3½ tons per hectare at 1/85¢ per kilogram..... 6475/

*Analysis provided by Gibb Boyd, Manager, Kibaha Foundation Seed Farm

Estimated Profits on Sorghum..... 1395/
Estimated Profits on Maize..... 4170/

Comments on Kibaha Farm Analysis

With the above fertilizer rates and good cropping practices, one would expect the above yields; but the limiting factor at Kibaha Seed Farm is the rainfall. The soils there have a very low water-holding capacity. Insufficient or delayed rainfall during the growing season could cut yields drastically. Dr. Spurling, of Ilonga Research, said that last year in the middle of the growing season he looked at the maize at Kibaha. At that time he estimated a 4½ ton yield per hectare. The rains stopped shortly after his visit and the final yield was less than 1.8 tons per hectare. At this time Ilonga composite maize looks very good. We will have to wait and see if the same thing happens to the maize yields this year.

A personal conference with Mr. Boyd gave further insights. He observed that the above yields for maize and sorghum crops probably could not be achieved more often than 1 year out of 10, because of regular summer drought periods. Since the very sandy soil has low water-holding capacity and since irrigation water is not economically available, it seems unwise to make further heavy investments in infrastructure without better assurance of good yields of the lines of foundation seed every year.

Appendix Section D

TANZANIAN SEED INDUSTRY SURVEY - Team No. 2

Summary of Team Contacts and Activities

Dates	Locations	Contacts		Special Activities
		Agency	Persons	
March 15 -16	Washington, D.C.	USDA USAID IRDB	Dr. Jerry West; B. Hill; B. Whittle; Ms. Lele; R. Jackson	Conferences and collection of relevant Tanzanian publications and information
March 17 -20	Washington-Rome DSM (travel)	FAO	Dr. Kunert; P. Dixon	Status of development projects
March 21 -22	Dar es Salaam	USAID/T	Peter Shirk & Staff Chas. Bernhardt	Orientation Review Reports
March 23 (Fri.)	Dar es Salaam	KILIMO	M. Mashelle; J. Beardall; C. Bernhardt	TanSeed Operations Soil Survey - Seed Farms
March 24 (Sat.)	Dar es Salaam	TRDB (ACDI)	Ron Gollehon	Credit; seed transport; marketing problems; etc.
March 25 (Sun.)	Dar es Salaam	--	Team Work	Preparation of report outline
March 26 (Mon.)	Dar es Salaam	USAID/T NAFCO World Bank Extension	Peter Shirk; A.J. Kaduri; J. Fraenkel; Otto Klempin Bob Maxwell	Preparation for safaris; seed production; storage; transport; etc. Proposed seed farms in Mwanza Region; evening conference on Tanzania programs and training

Summary of Contacts and Activities - Team No. 2 (Cont.)

Dates	Locations	Contacts		Special Activities
		Agency	Persons	
March 27 (Tues.)	Dar es Salaam	KILIMO USAID	John Beardall; Fuchs-Carsck; Shirk; French	Reviewed soil surveys for proposed seed farms Review preliminary report outline and travel schedule
March 28 (Wed.)	Dar es Salaam	World Bank (TRDB)	Mr. Gore	Transport and Seeds Project Proposal in Selected Regions
March 29 (Thurs.)	Dar es Salaam	USAID	Shirk and staff	Conferences and final preparation for safaris
March 30 (Fri.)	Dar es Salaam to Morogoro to Mikumi Lodge (accompanied by S. Ishengoma, Asst. Mgr. of Kibaha Seed Farm) Morogoro Region	Seed Lab College of Agriculture Regional Staff	Joseph Mallya and staff M.L. Kyomo, Dean R.N. Misangu, Crops Lect. R.J. Foote, Head, Econ. Dept.; J.I. Rugambisa, Ag. Econ.; J. De Vries, Sr. Lect. Extension RDD, RADO, etc.	National seed lab facilities and procedures Reviewed research, teaching and training programs of College of Agriculture --coordination and linkages Programs and reports
March 31 (Sat.)	Mikumi to Iringa Dabaga to Iringa	Regional Staff (Iringa) KILIMO TANSEED	RDD, RADO, and Staff Lewis Jones, Mgr., Dabaga Seed Farm Lenn Budd, Prod. Mgr.	Programs and reports Visited seed farms Plans and problems TANSEED - Certified seed program

Summary of Contacts and Activities - Team No. 2 (Cont.)

Dates	Locations	Contacts		Special Activities
		Agency	Persons	
April 1 (Sun.)	Iringa to Chimala	Travel	-	-
April 2 (Mon.)	Chimala - Mbeya - Chimala	Regional Office KILIMO	RDD and RADO Office Uyole ARI and MATI Geo. T. Neema, Director	Brief visit Arranged with Neema for special conference on Wednesday
April 3 (Tues.)	Chimala - Njombe - Chimala -	TANSEED TANWATT	C. Derek Else - G. Sec. Lewis Ngonyani - Branch Mgr.; Will Rogers - G. Mgr.; E. Rowland, Asst. Mgr.; Robin Haggerty - Agronomist	Tour of TANSEED processing and storage facilities; mgt. procedures; distribution to depots Tour of research work and hybrid maize production for TANSEED
April 4 (Wed.)	Chimala - Mbeya - Iringa	KILIMO	UYOLE: ARI: Mr. Mascha - Acting Dir. R. Mwambere - R. O., Plant breeding F. Maximambali -R.O.Hot. M. Jacobson (Finn) - Potatoes; Robert Matson (Swede) - Agronomist UYOLE: MATI: P.P. Kimiti, Principal C.K.J. Ponjee, R.O./Extension	Conference with staff revealed key features of sonal and regional integrated programs for research, teaching and extension. Also, current problems and future plans. Provided key data on no. students; curricula; special short courses and workshops; and coordination of research,

Summary of Contacts and Activities - Team No. 2 (Cont.)

Dates	Locations	Contacts		Special Activities
		Agency	Persons	
				teaching, and extension in zonal, regional and district programs
April 5 (Thurs.)	Iringa - Dar es Salaam (Travel)	USAID	Shirk; Bernhardt; et al.	Arrangements for safari to Tanga and Arusha
April 6 (Fri.)	Dar es Salaam to Tanga	KILIMO (Mlingano)	Mr. Mosha, Principal MATI	Introduction to ARI and MATI programs at Mlingano; arrangements for Saturday a.m. conference
April 7 (Sat.)	Tanga	Regional Offices	RDD - Mr. Mallamia RADO - Joas E. Mannento RPO - Mr. Rwechungura	Explanation of regional and district programs for research, extension, and training
		KILIMO	Tanga Regional Agri. Dev. Project (German assistance); Duvel Carl-Heinz (Extension) Carl E. Schwemer (Coordinator); H.U. Kiuruwi (Hort.); Walter Hauth (Extension)	2-Hour conference with RADO, RPO, and German staff on research, extension, and training programs for experimental Regional Agri. Dev. Project; special attention to the model extension program

Summary of Contacts and Activities - Team No. 2 (Cont.)

Dates	Locations	Contacts		Special Activities
		Agency	Persons	
April 7 (Sat.)	Tanga to Arusha	LIDA	LeRoy Williamson, Prof. Leader; Harall Baumgarmor; Phil Cobb; Dannie Gates	Conference on Tsetse fly eradication and other LIDA projects; production of certified legume and grass seeds
		MATI and ARI	Mr. A.S. Mosha, Director	Explained research and training programs at Mlingano - special training, curricula, courses, etc.
April 8 (Sun.)	Arusha	University of Missouri	Team Members	p.m. reading and report revisions
April 9 (Mon.)	Arusha	Regional Office (a.m.)	M. Muro - RADO; Steve Neema, Asst. RADO; P.W. Nzeru, Nat. Maize Project; E.K. Kapela, Extension; Mr. Parkapieni, Director, Masai Project; Mr. Mtakyawa, Land Use, P.O.	Conference with staff on overall regional programs in research, training, and extension--scheduled later conferences for details

Summary of Contacts and Activities - Team No. 2 (Cont.)

Dates	Locations	Contacts		Special Activities
		Agency	Persons	
		Foundation Seed Farm (p.m.)	Chas. Mmari - Gen. Mgr. Ted Lane - Mech. Spec.	Tour of machine shop and storage; parts room; and over farm to observe crops and problems (erosion severe); also inspected seed drying, processing, and storage facilities
April 10 (Tues.)	Arusha to Tengeru (a.m.)	Seed Lab MATI and ARI	Mr. Kapinga - FAO; Sammy Liampawe - Lab Asst. M.L. Kusekwa - Principal Mr. Segera - Coordinator of Studies; Mr. Mwakipesile - Asst. of Studies	Tour of seed lab and facilities for testing Explained certificate and diploma programs and coordination of teaching with seed lab, research, and extension programs
	Tengeru to Arusha (p.m.)	TANSEED (National Office)	Bakari Lusewa - Gen. Mgr. (Not available) Prosper F. Mackey - Mkt. Mgr.; Lenn Budd - Seed Prod. Controller	Explained TANSEED operations, Branch Offices, regional depots, problems and future plans
April 11	Arusha (8:00 a.m.)	TANSEED	Solomon N. Nnko-Branch Mgr.; Lenn Budd; P.F. Mackey	Tour of TANSEED drying, processing, and storage facilities

Summary of Contacts and Activities - Team No. 2 (Cont.)

Dates	Locations	Contacts		Special Activities
		Agency	Persons	
April 11 (Wed.)	Arusha (9:00 a.m.)	Regional Offices	P.W. Mzeru - Nat. Maize Project; E.K. Kapela - Extension	Detailed explanation of organization of regional, district, ward, and village extension programs in Arusha Region--problems and future plans
	Arusha	TANSEED	Lenn Budd; P.F. Mackey	Visit to select certified seed producers; condition of crops and production problems
April 12 (Thurs.)	Arusha to Dar es Salaam	-	--	--
April 13 (Fri.)	Dar es Salaam	KILIMO	Evening--Dr. Duffield	Reviewed crop research in Tanzania
April 13 -17	Dar es Salaam	--	Team Members	Writing report
April 18 (Wed.)	Dar es Salaam	Manpower Survey	Roger Simmons, Consultant; Anita Mackie, Ag. Economist	Evening meeting to review manpower survey--training and staffing
April 19 (Thurs.)	Dar es Salaam	--	Team Members	Writing report

Summary of Contacts and Activities - Team No. 2 (Cont.)

Dates	Locations	Contacts		Special Activities
		Agency	Persons	
April 19 -23	Dar es Salaam	--	Team Members	Review and finalizing first draft of report
April 24 (Tues.)	Dar es Salaam to various destinations	USAID/T Tan Gov. Other Agencies	Team Members Agency Officials	Debriefing conferences to review report and get suggestions for modifications for final report
April 24 (Tues.)	Dar es Salaam	Evening dinner meeting; KILIMO	Dave Spurling, Maize Breeder; Jim Deutsch, Maize Breeder; Chas. Bernhardt, Project Coordinator; Seed Farms	Reviewed research problems and progress, related to maize and other food grains; functioning of Foundation Seed Farms and suggestions for improvements
April 25 (Wed.)	Dar es Salaam to various destinations	--	Team Members	Departure from Dar es Salaam

APPENDIX SECTION E

Biographical Data
University of Missouri Staff Members
Assigned to Tanzanian Project

A. ALBERT R. HAGAN--Team Leader, Specialist in Farm Management and Extension

1. Professional Training: B.S. in Agriculture, University of Missouri
   M.S. in Extension, University of Missouri
   Ph.D. in Agricultural Economics (Minor in Extension), Michigan State University

2. Professional Experience (U.S.):

   a. Missouri County Extension Agent--3 years
   b. University of Missouri, Extension Specialist in Farm Management--15 years
   c. University of Missouri, Professor of Agricultural Economics--Research, Extension, and Teaching, with special emphasis in farm management and planning for family-size farming operations--1959 to date

3. Professional Experience (International):

   Overseas assignments in other countries have consisted of short-term consultancies related to economic aspects of agricultural development, especially in relation to farm planning and management as a basis for increasing food production.

   1971*--USDA consultant in Nepal--3 months
   1973---USAID consultant with University of Missouri team in Tanzania--3½ months
   1974---USAID consultant with University of Missouri team in Tanzania--10 days
   1974*--USAID in Nepal--2 months
   1977*--FAO in Libya--6 weeks
   FAO in Barbados--8 weeks
   1978*--USAID in Tunisia--6 weeks (February/March)
   *--USAID in Tunisia--4 weeks (June/July)

   *For these assignments, primary responsibility was assumed for report preparation, either individually or as team leader.

B. ROBERT BEVINS--Seed Marketing, Processing, Storage and Credit Specialist

1. Professional Training: B.S. in Agricultural Education, University of Tennessee
   M.S. in Agricultural Economics, University of Tennessee
   Ph.D. in Agricultural Economics, Michigan State University

2. Professional Experience (U.S.):

   a. Agriculture teacher, Indiana
   b. Farmer, Tennessee
   c. Extension Marketing Specialist, University of Tennessee
   d. Extension Economist, Michigan State University
   e. Extension Economist, Kansas State University
   f. Extension Economist and Professor, University of Missouri

3. Professional Experience (International):

   a. Marketing, Food Crops Study, Tanzania, 1973
   b. Loan Evaluation, Tanzania, 1975

C. LLOYD E. CAVANAH--Seed Law, Production, Processing and Certification Specialist

1. Professional Training: B.S. in Agriculture, University of Missouri
   M.S. in Agronomy, University of Missouri

2. Professional Experience (U.S.):

   a. Professor, Department of Agronomy, University of Missouri for about 31 years
   b. Director/Manager of Missouri Foundation Seeds, 17 years
   c. Executive Secretary of Missouri Seed Improvement Association, Inc., 7 years
   d. Superintendent of University Agronomy Farm, 23 years
   e. Overseer of University Seed Testing Laboratory, 27 years
   f. North American Association of Offical Seed Certifying Agencies (has served on 6 or more committees each year since 1955)
   g. Teaching--courses in Grain Crops Production, Seed Processing, Marketing and Grading

3. Professional Experience (International):

   1978 November/December, Member of University of Missouri team in Tanzania, primarily in Dar es Salaam and Arusha, in connection with the Tanzanian Seed Industry Survey

D. JOHN M. POEHLMAN--Institutional Organization, Management, Planning and Seed Research and Agricultural Research Specialist

1. Professional Training: B.S. in Agriculture, University of Missouri
   Ph.D. in Botany, University of Missouri

2. Professional Experience (U.S.):
   a. Professor, Department of Agronomy, University of Missouri
   b. Associate Chairman, Department of Agronomy, University of Missouri
   c. Research: breeding wheat, oats, barley
   d. Chairman, College and Department Seed Production Committees
   e. Member, College of Agriculture, Policy Committee
   f. Member, University Graduate Senate Council
   g. Member, University Faculty Policy Committee
   h. Chairman, University International Programs Committee (assisted establishing University Center for International Programs and Studies
   i. Wrote Textbook: Breeding Field Crops

3. Professional Experience (International):

1963-65	USAID/UMC, Research Adviser to Orissa University Agriculture Tech., Bhubaneswar, India Developed plan in OUAT for Agricultural Experimental Station, used as model by other Agriculture Universities in India Wrote Textbook: Breeding Asian Field Crops
1971	Consultant, Government ROMANTA/USDA, wheat, soybean production
1972-75	Organized and coordinated International Mungbean Nurseries, with USAID support, grown in 20-30 countries, Asia, S.A., Africa
1975	Consultant, World Bank team, India Seed Production Project
1977	Consultant, USAID/GOVT. MALI, Develop strategy to upgrade Agricultural Research in Mali
1977	Consultant, USAID, represent AID at Mideast Barley Conference, Amman, Jordan, and International Mungbean Symposium, Philippines
1978	Consultant, Office Rural Development, Korea, wheat and barley research

APPENDIX SECTION F

Copy of

Work Order No. 7

Assignments

UNITED STATES OF AMERICA
AGENCY FOR INTERNATIONAL DEVELOPMENT

1. Country of performance Tanzania

2. Mark one and insert appropriate numbers:
☐ Indefinite Quantity Contract No. [illegible], Work Order No. 7
☐ Requirements Contract No. _____, Delivery Order No. _____
☐ Basic Ordering Agreement No. _____, Task Order No. _____

NEGOTIATED PURSUANT TO THE FOREIGN ASSISTANCE ACT OF 1961, AS AMENDED, AND EXECUTIVE ORDER 11223

3. CONTRACTOR (Name and Address): The Curators of the University of Missouri 215 University Hall Columbia, Missouri 65201	4. CONTRACTING OFFICE (Name and Address): Agency for International Development Office of Contract Management Services Operations Division Washington, D.C. 20523
5. PROJECT OFFICE (Name and Address): R.N. Depp, AFR/DR/EAP	6. SUBMIT VOUCHERS TO (Office Name and Address): Office of Financial Management (SER/FM/PAD) Agency for International Development Washington, D.C. 20523
7. EFFECTIVE DATE: See ARTICLE VI	8. ESTIMATED COMPLETION DATE: See Article VI

9. ACCOUNTING AND APPROPRIATION DATA (Insert appropriate numbers):

Amount Obligated: $61,500 PIO/T No.: 698-[illegible]

Appropriation No. [illegible] Allotment No.: 845-61-698-00-69-81

10. The United States of America, represented by the Contracting Officer signing this Order, and the Contractor agree that: (a) this Order is issued pursuant to the Contract or Agreement specified in Block 2 above and (b) the entire Contract between the parties hereto consist of this Order and the Contract or Agreement specified in Block 2 above.

11a. NAME OF CONTRACTOR: THE CURATORS OF THE UNIVERSITY OF MISSOURI	11b. UNITED STATES OF AMERICA AGENCY FOR INTERNATIONAL DEVELOPMENT
BY (Signature of authorized individual): Bob Jenkins	BY (Signature of Contracting Officer):
TYPED OR PRINTED NAME: Bob Jenkins	TYPED OR PRINTED NAME: M. Snyder
TITLE: Acting Director, Grants & Contracts	TITLE: CONTRACTING OFFICER
DATE: 7/29/81	DATE:

[illegible] Form (1/79)

ARTICLE I - TITLE

Tanzania Seed Industry Survey

ARTICLE II - OBJECTIVE

To provide a team to assist USAID/Tanzania to conduct a survey of the Seed Industry.

ARTICLE III - SCOPE OF WORK

A. General

1. To review the distribution of certified seeds from multiplication farms to the ultimate small farm user;

2. To identify bottlenecks in the distribution system;

3. To recommend TanGov actions necessary to eliminate the constraints; and

4. To suggest types of USAID assistance that would enable the TanGov to overcome the constraints.

B. Specific

1. Assess the techniques being utilized to determine demand for the various types of certified seed. Determine the role of each organization involved. Analyze the effectiveness of projecting and meeting demand. Suggest a methodology to use in determining seed demand and recommend the organization(s) in which such responsibilities should lie.

2. Review the techniques being followed for contracting of certified seed multiplication, including criteria for selection of contract growers, oversight by TanSeed, quality of seed multiplication practices and success in using contract growers to product certified seed.

3. Review the seed law, including the effect to which it is relevant to Tanzania.

4. Review the seed inspection testing and certification system and determine its adequacy for controlling certified seed production. If a system does not (effectively) exist, make recommendations in this regard in particular identifying organizations that should have the responsibility.

5. Assess the handling of Foundation seed and marketing of certified seed, particularly with regard to the adequacy of storage, transportation, promotion, and sales to regions and villages.

6. In light of all the above tasks, review the operation and management of TanSeed and suggest ways that TanSeed might be strengthened and/or incorporated into another management entity.

7. Review the activities of regions and districts in seed promotion, extension, and sales.

8. Assess the role of the Tanzania Rural Development Bank in extending credits to small farmers for purchase of certified seed. Determine ways in which credit function might be linked with other organizations/activities in seed distribution.

9. Analyze the potential use of a strategic seed reserve to overcome seed shortages in low production years. Include suggested locations and management responsibilities.

10. Review the agricultural research program in terms of whether or not it is providing Foundation seed farms with appropriate types of seed. Assess the effectiveness of evaluation within the research program regarding small farmer acceptance of improved seeds released by the research stations.

11. Considering the above points, recommend a management/organizational framework which will insure maximum coordination and consolidation of the various components in the seed distribution system.

ARTICLE IV - REPORTS

The contractor shall submit a draft report which shall be submitted to the USAID/Tanzania Mission Director at least two weeks prior to the team's departure from Tanzania. The final draft of the Mission-approved report is to be hand carried to the contractor's headquarters for final typing and reproduction. Twelve copies of the final report are to be submitted to Rose Marie Depp, AFR/DR/EAP, Room 2450, N.S., AID/Washington no later than four weeks after the team's departure from Tanzania.

ARTICLE V - RELATIONSHIPS AND RESPONSIBILITIES

The contractor shall be technically responsible to the USAID/Tanzania Mission Director, or his designee, for reporting and liaison with the Tanzania Government. AID/Washington backstopping will be provided by AFR/DR/EAP, R. M. Depp and in USAID/Tanzania by the project manager, William Jadwin.

ARTICLE VI - TERM OF SERVICES

Effective Date: Date of signature of the contracting officer

Estimated Completion Date: May 31, 1979